THE

Practical Teacher

A MONTHLY EDUCATIONAL JOURNAL

Edited by JOSEPH HUGHES.

'*Knowledge is proud that he has learned so much,*
Wisdom is humble that he knows no more.'—COWPER.

VOL. III. No. 10. DECEMBER, 1883. PRICE 6D. POST FREE, 7½D.

The Teacher's Health.

BY ALFRED CARPENTER, M.D. (LOND.), M.R.C.P. (LOND.), C.S.S. (CAMB.),
Vice-President of the British Medical Association.

THROAT AND VOICE—(*continued*).

(5) *The sore-throats of fevers, etc.*—Aphthæ sometimes arise in the course of some kinds of debilitating diseases, and frequently usher in the end. This event happens in Phthisis or Consumption, in Mesenteric diseases, and other states, attended by long-continued and exhausting discharges. Old women regard the onset of *Thrush*, as it is called, as a fatal sign; but in some fevers it simply indicates an exfoliation of the mucous surface which corresponds with the desquamation of the cuticle, which is the sequence of Scarlatina. This desquamation really follows after all acute fevers, but not being so rapid as in scarlatina, it is not so evident.

The sore-throat of Diphtheria is very insidious. There is often a feeling of uneasiness only, scarcely calling for remark; the voice not being affected. Persons coming in contact with cases of diphtheria, will sometimes keep the feeling to themselves for fear of being regarded as nervous. If an expert looks into the throat of such an one he may see a slight patch of ash-coloured mucus membrane on the fauces which indicates the commencement of the disease. If this be healed at once, the mischief may be cut short and the evil arrested *in limine*. If it be neglected the cacozyme upon which the development of the disease depends may find admission into the blood of the patient, and an attack of the disease has to be submitted to. Diphtheria may be local in its origin. That is, it may be caught, some of the germs which produce the disease being planted in the throat, gaining a settlement, it may be, with difficulty. The mischief, if attacked at once, may be eradicated and the case prevented. This is probably the usual way in which the disease-germ finds admission; but some constitutions are much more predisposed than others. The germ developes at once if the system has been prepared for it by the patient living in an unsanitary atmosphere, or upon an improper diet. In the one case the system is already prepared, and the onset of the disease is immediate; in the other the germ has to fructify and to reproduce itself, and so undermine the constitution before it can gain admission as a colony and be powerful enough to influence the whole of the body and set up the disease. If therefore diphtheria exists in a school, it is right to examine every day the throats of all who have been in contact with the case, or with the surroundings which have given rise to it, for some week or two after its first discovery, and the inspection continued for some ten days after the last case has appeared. The throat in all suspicious cases should be dusted with fine sulphur powder, or gargled with a weak solution of sulphurous acid.

The sore-throat of scarlatina is generally attended by more or less fever. It is always prudent to use the thermometer in any suspicious case, and if there is a decided rise of temperature above the normal point in any one who has a sore-throat, to place the patient in quarantine at once, and send for the ordinary medical attendant.

(6) *Acute laryngitis.*—This disease is not uncommon among teachers, especially those who will keep their classrooms too warm. It is an acute inflammation of the mucous membrane which lines the larynx; especially that part of it upon the vocal chords and the epiglottis. Its danger arises from the accident of situation. There is none attending the same condition of membrane if it developes an inch or two higher or lower in the throat, but a small swelling on the vocal chords and the epiglottis narrow the chink of life to an alarming degree in a very short time.

There is generally great constitutional disturbance, with difficulty of breathing and swallowing, with a dry, harsh cough, a hoarse voice sinking into a whisper, and a wheezing, hissing inspiration, rapidly terminating in asphyxia and death, unless the disease is arrested or the surgeon comes to the aid of the patient, and cuts his throat to save his life; that is, makes an opening below the larynx and allows air to find access to the lung by a short cut through the parieties of the windpipe. The treatment must be vigorous, such as an emetic, if the tongue is loaded, frequent doses of antimonials or ipecacuanha, hot baths, so as to produce rapid and free perspiration, and a moist warm air in the room. Care must be taken to distinguish the disease from diphtheria. It may be recognised by the sudden constitutional disturbance, and the dysphagia or pain on swallowing without the ocular evidence of mischief in the fauces. It is not usual to

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find much pain on swallowing in the early stages of the infectious disorder; but it must not be forgotten that extension to the larynx is not uncommon in diphtheria, and then the symptoms are very similar to those of acute laryngitis.

The acute form of the disease sometimes comes on as a sequence to a chronic state when there is ulceration of the organ, as in some syphilitic forms, and in the progress of so-called laryngeal phthisis. The condition only requires mention here.

(7) *Chronic sore-throat, Follicular sore-throat, and* (8) *Clerical sore-throat* may be considered together. These conditions, once developed, are very difficult to remove on account of three or four different circumstances. There is a relaxed mucous membrane, which is kept up by the state of the constitution or by the habits of the patient. The mucous follicles in the tonsils produce a cheesy kind of secretion, which cannot get out by the ordinary duct; the follicle distends, then inflames, and the yellowish-white secretion escapes, leaving the follicle thickened, which excess has afterwards to be removed by absorption. In this form it corresponds to acne on the face, and is as difficult to remove. Each follicle must have the sebaceous matter picked out by a lancet, or eased out by the end of a surgeon's 'director,' and the throat painted with tannate of glycerine twice daily, at the same time gargling with cold water and sluicing the outside of the throat with a cold douche night and morning. There is another form of sore-throat which is allied to herpes—small blisters form on the vellum and palate. It is more painful than the follicular kind, which is attended by uneasiness only, except when a follicle larger than usual suppurates. The other circumstances which render those conditions difficult of removal are the constitutional habit, which may have either a tubercular or a gouty origin. The one requires a treatment somewhat opposite to the other. The affection is often allied with a dyspeptic condition, which is kept up by the unwholesome food with which the patient indulges himself, or the local irritation is daily continued by an irresistible habit of smoking, or the patient is utterly unable to give the organ that rest which it must have to recover from the effects of the mischief. In the case of the clergyman or public speaker, the relaxation remains in, or has extended to, the vocal chords. It can only be cured by a long-continued perfect rest of the organ and voice, with attention to and removal of the allied causes I have mentioned. Lastly, the mischief is often kept up by the patient continuing to live in an unhealthy habitation, or a malarious district. A change of air is followed by rapid recovery. A return to the same house is followed by a relapse. When this is the case the only chance of complete cure will be found in a permanent removal from the place itself.

(9) *Enlarged tonsils* have been already alluded to. They follow upon follicular sore-throat for the reason above mentioned. The tonsils are oval-shaped glands enclosed in a fold of mucous membrane, and situated between the two pillars of the fauces. In my early days I used to remove them by means of a guillotine. I do not think I ever did much good by the operation, except when they became so large as to prevent the patient sleeping, or causing him to make so much noise in his sleep that others were disturbed by his noise. The enlargement may be got rid of by astringent applications and proper tonics, such as citrate of iron, and the continuous use of hædozone. The remaining conditions, which sometimes invade the throat, cannot be treated except by experts, although it will be right to refer to the chronic coughs which are kept up by throat irritation. These conditions are frequently remedied by painting the throat over with tannin solutions, with tincture of iodine, or tincture of benzoin when the cause is local. When it is nervous only, the best remedies are those which strengthen the system without having a direct local action, such as the internal administration of iron, valerianate of zinc, and other tonics, but it is always best, in such cases, to get medical advice.

There is a cough which is sometimes kept up by irritation in the ear. It is spasmodic in its character; the cure is obtained by removing the source of irritation. Treatment must be directed to the ear and not to the throat.

Laryngismus stridulus, or spasmodic croup, is a disease of a spasmodic nature, which attacks young children rather than schoolboys or teachers. It is allied to other spasms affecting the throat, and requires immediate medical treatment; not so the *Globus hystericus*, which belongs to young women, but not exclusively to them, for it is common among teachers of both sexes. There is a throttling or suffocating feeling suddenly developed in the throat, which is entirely nervous, produced by mental causes, in a constitution lowered by study, or intemperance of any kind. It is hysterical in its nature, and must be met by appropriate remedies. The simplest are the best, viz., drinking a glass of cold water, removal into the fresh air, and the immediate section of any tight lace or other bandages which may have ligatured the frame; but it can only be cured by removing the penultimate cause, which, in most cases, is a vicious habit of some kind or other. *Aphonia*, or complete loss of voice, is sometimes hysterical, sometimes the result of paralysis; it often occurs after diphtheria, and will be recovered from by using constitutional means and the local application of galvanism.

The Voice.—Vocal sounds differ in three important directions. Changes in the characteristics which belong to each of these regulate the ability of the vocalist or impede his natural power. These intrinsic divisions are as follows, viz. (1) quality; (2) intensity; (3) pitch.

1. *Quality*, '*Timbre*,' is the peculiarity of sound which enables it to penetrate to long distances, and to set up those characteristics by means of which we recognise one voice from another, or the sound of the harp from that of the violin or organ. A musician will distinguish between two persons playing upon the same flute. We recognise our friend in the dark by the sound of the voice. The cause which enables us to make this recognition is beyond common comprehension, but it is connected with the shape or conformation of the series of waves of sound which together assist to make the changes upon which the difference depends. In every sound there is a fundamental or 'ground tone.' Commingling with it there are feebler sounds which bear to it simple relations of harmony, and which are styled by the experts in sound as 'upper tones' or 'over tones;' when these are in perfect accord the effect is agreeable; if not in perfect accord there is a discordant tone, which is unpleasant and is called 'discord.' All these combine to shape or form the vibration which is to produce the effect and determine the '*quality*.' There is harmonious combination of ground tones with upper or

over-tones, and it is the delicacy of these shades which produce the *timbre* of the human voice. The capacity of a cultivated voice to prolong a series of notes is almost incredible. The quality of the voice is mainly dependent upon resonance in the cavities which are located in the face, viz., the mouth, nose, and throat. The vocal chords are the generators of tones, and alterations in the condition of the cavities alluded to will lead to alteration in the quality of the voice. We recognise a man with enlarged tonsils, or with polypus, by a characteristic sound in the voice; so also the loss of teeth at once interferes with the power of voice; the removal of a portion of the palate by disease, and indeed any change in any part of the vocal passages influences the character and alters the quality of the voice.

2. *Intensity* simply means loudness; it is connected with the size of the waves of sound or undulations set up in the atmosphere. These waves travel in every direction from the point of disturbance. The larger the wave the louder the sound. The longer the vibration the larger the movement of air; the shorter the vibration the feebler will be the sound which is produced by it.

3. *Pitch.*—This is the range or compass of sound of which the voice is capable. The entire range of both the male and female voices is said not to exceed five octaves. There are but few individuals who can take in more than two and a half octaves in the compass of their own voice. The modification of pitch arises from variations in the tension of the vocal chords, with slight variations in the rima glottidis. These variations in tension and shape are produced by complex muscular actions, by extremely minute muscles acting upon the various parts which make up the larynx. The pitch is also altered at will by the force with which the current of air impinges upon the more or less tightened chords, or hisses through the rima glottidis or chink with greater or less rapidity of movement.

The pitch, therefore, depends partly upon the number of vibrations—the greater the number the higher the pitch; the intensity is increased by the shortness of the vibrating chord, for the shorter that chord is the more rapidly it can vibrate in a given time. Hence it will be seen that the human voice is governed by the laws which regulate sound as much as any other musical instrument, and that any change in the condition of that instrument, such as arises in the slightest alterations in moisture, muscular power, or the delicacy of feeling, will be at once detected in the alteration which takes place in the pitch or the quality of the voice itself.

(To be continued.)

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Physiology.

BY ARTHUR NEWSHOLME, M.D. LOND.,

Gold Medallist and University Scholar, Physician to the City Dispensary.

CHAPTER VII.—ANIMAL MECHANICS.

THE bones and muscles of the body form the two parts of the body concerned in motion and locomotion. The bones are moved by the contraction of muscles, at the points where they join each other, *i.e.*, at their articulations. The bones, in fact, form *levers*, while the muscles are the sources of power for moving these. By a lever we mean a rigid bar turning freely about a fixed point, called the *fulcrum*. The position of the fulcrum in relation to the motor power and to the resistance to be overcome, or *weight*, determines the variety of lever.

It is evident that there may be three kinds. In the first kind, the weight is at one end, the power at the other, and the fulcrum between these; or, representing these three parts by their initial letters, their order is W., F., P. Common instances of this variety occur in the balance, and in the ordinary way of using a poker. In the human body there are some examples of it. Thus, after stooping forwards, the hamstring muscles attached to the back of the innominate bone above, and to the bones near the knee below, contract and pull the weight of the body up and back, while the hip-joint forms the fulcrum between these.

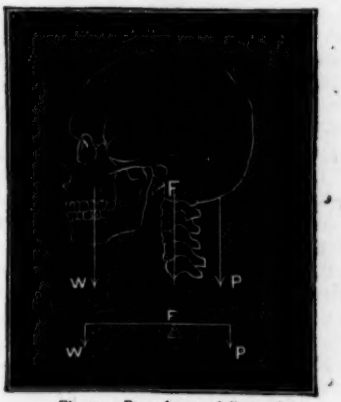

Fig. 30.—Bony Lever of first order.

In maintaining the erect position of the head, there is a similar mechanism. Here the fulcrum is at the point of articulation of the head with the cervical spine, the weight of the head tends to make it fall forwards, the muscles of the nape of the neck prevent this (Fig. 30).

In the second kind of lever the weight is placed between the fulcrum and power, as when one raises the handles of a wheelbarrow. We may represent it graphically as P. W. F. In the human body this kind of lever is seen, for example, in raising oneself on tiptoes. The weight of the body evidently is communicated through the leg to the part of the foot near the ankle-joint, the fulcrum is the point of contact of the toes with the ground, and the power is applied at the heel by the attachment there of the calf muscles (B., in Fig. 32.)

The act of opening the mouth by depressing the lower jaw is another example of the same kind. The tension of the muscles tending to shut the jaw represents the weight, the articulation of the jaw behind is the fulcrum, and the power is exerted by the muscles below the jaw.

In the third kind of lever, the power and weight act on the same side of the fulcrum, but the power is nearer the fulcrum than the weight. Thus, when a man pulls the upper end of an inclined ladder from against the wall towards him, his foot at the base of the ladder acting as fulcrum, and the weight of the ladder acting higher up than the point of application of the power. This variety of lever is represented by F. P. W. In the human mechanism, a common

example of it is seen in bending the fore-arm on the arm.

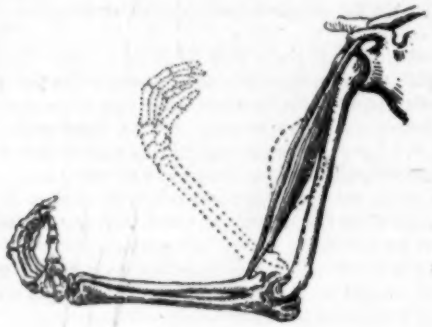

Fig. 31.—Bony Lever of third order.

The fulcrum is at the elbow-joint. The weight of the whole fore-arm which has to be pulled up may be supposed to act a little below its middle, while the power, that is the biceps muscle, acts at its point of insertion into the radius, close below the elbow-joint.

All the three orders of levers may be illustrated by different effects of the calf muscles on movements of the foot. We have already seen that in standing on the points of the toes, the foot forms an illustration of a lever of the second order (B., Fig. 32). When the foot is raised and the toes then depressed, as in working a pedal, the weight is at the toes, the ankle-joint forms the fulcrum, and the calf muscles the power (A., Fig. 32); while, when one moves a weight up and down which is resting upon the toes, the foot forms a lever of the third kind (Fig. C.). The ankle-joint is the fulcrum, the weight is at the toes, and the power acts through the muscles in front of the leg.

Fig. 32.—The three Orders of Levers, illustrated in the Foot.

In any lever, the effect of the power used varies with the length of the arm of the lever with which it is connected, that is, with the distance from the fulcrum. It was this principle which led Archimedes to say that given a fulcrum or point of resistance, and a sufficiently long lever, he could raise the world. It is evident from this consideration, that the second lever is the one in which the greatest mechanical advantage is gained. No lever, however, multiplies force; what one gains in one respect one loses in another. What one gains in force is lost in swiftness and in space traversed, or *vice versâ*. In the human body the second kind of lever, though mechanically the best, is the least common; advantage as to power is sacrificed for the sake of a greater range of movement. In the first and third kinds of lever, it is obvious that the fulcrum and power are too close together to allow of the exercise of great force, but this is of less consequence than rapidity of action and great range of movement.

Another point of importance in reference to these bony levers, is the angle at which the power acts on the arm of the lever. It is only when the angle is a right angle that the muscle produces its maximum effect. The action of the muscles of the calf on the heel is an instance of such relation, but there are not many such. The more oblique the relation of the muscle to the bone, and the greater is the disadvantage under which the former labours. Thus, supposing the arm is extended, and the biceps is made to contract, the first half of the effect, that is, before the forearm reaches a position at right angles to the arm, is much more difficult to accomplish than the remaining part.

The *maintenance of the erect posture* involves a continuous muscular contraction of a number of groups of antagonistic muscles. To maintain this posture, it is obviously necessary that a vertical line passing through the centre of gravity of the body should fall within the point of support—the feet. That this is so is shown by the varying position when a burden is carried. If the burden is carried on the back, the tendency is to lean forward; if the burden is in front, as, for instance, in those who have to carry a large amount of abdominal fatty tissue, the shoulders are thrown back, so as to alter the centre of gravity to a corresponding extent.

The foot is the basis of support. The calf-muscles contract and pull the thighs back, and so prevent falling forwards. At the same time, the antagonistic muscles of the front of the thigh and leg contract, and pulling the body forward, neutralise the action of the calf-muscles. Then the muscles of the buttocks, spine, and back of neck balance the tendency of the thigh and pre-vertebral muscles to pull the trunk forwards; while the muscles of the front of the abdomen and neck prevent the spinal and cervical muscles from pulling the trunk backwards. It is evident from this that there are two sets of muscles in the body; one tending to pull the body forwards, and the other backwards, and that these in the erect posture balance each other. Also, as the tendency of the weight of the body and of the head is to make them fall forwards, we find that the muscles of the back and nape of neck are larger and stronger than the corresponding muscles anteriorly.

In *walking*, the legs may be regarded as movable points of support for the trunk, while at the same time they are agents of propulsion. Nearly every muscle in the body is exercised during walking, either directly for progression, or indirectly for balancing the head and trunk. The muscles of the arms are least concerned, but are used to some extent instinctively and rhythmically. There are three chief acts in walking. Suppose one starts with the left leg. The first act, or combination of acts, is that the left leg is raised, and at the same time the trunk is so pulled forwards, that it would fall prostrate were it not prevented by the second act, which is the advancing of the right foot. This is effected partly by a sort of pendulum action, the leg swinging forwards at its articulation with the innominate bone, and partly by muscular action, the hamstrings bending the leg on the thigh, the anterior thigh-muscles bending the thigh on the hip, and the muscles on the front of the leg raising the front of the foot and the toes, so as to prevent dragging of the foot along the ground. The pendulum action tends to economise muscular exer-

tion: the amount of excursion of the pendulum varies according to the length of the leg, and so the size of the step varies in different individuals; but in all cases a considerable amount of muscular exercise is also involved. When the right foot has reached the ground, the third act ensues. The action of the muscles of the left calf continues, and by pulling up the heel, throws the weight of the body still more over the right leg, until the left leg in its turn swings forward. Provision is made for throwing the centre of gravity of the body over the line of support, which is formed by the bones of each leg in turns. This is effected by means of a slight rotation of the pelvis on the head of the femur, combined with a slight movement of the whole trunk and leg over the foot which is being planted on the ground.

In *jumping*, there is a sudden and forcible contraction of the calf-muscles, so that the body is jerked off the ground. The effect is increased by muscular contractions, bending the thighs on the pelvis and the legs on the thighs, and then suddenly straightening out the legs, thus giving an impetus which propels the body through the air.

Running consists of a series of rapid, low jumps with each leg alternately, so that during each complete muscular act there is a moment when both feet are off the ground. Running differs from walking, in that (1) in walking, the whole propulsive action arises from the foot, while in running, the knee and hip-joints are both greatly bent, giving great additional impulse by their extension; (2) in running, the heel is not brought to the ground, in walking it is.

The muscles of the face are most delicate in their structure, the fibres of which they consist being smaller than those elsewhere, and being sometimes branched (a very exceptional feature), as well as being occasionally connected with the skin. Contraction of different facial muscles corresponds closely to different emotions. Thus a kind of language is contained in the expression of the face. It is this physiognomical language which the infant learns long before it knows anything of articulate speech. Joy, grief, irony, thought, may all be expressed by the facial muscles, and these different aspects may be imitated by causing contraction of individual muscles by means of galvanism.

(*To be continued.*)

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REV. J. G. WOOD IN AMERICA.—This popular naturalist has accepted the post of Lowell Lecturer at Boston, and left England on the 17th ult. in the *Cephalonia*. He will go from Boston to New York, there to deliver a course of sketch lectures at the Cooper Institution. On its completion he contemplates a lecturing tour through the States and Canada.

DYEING CUT FLOWERS.—Some of our readers may have heard of the possibility of altering the colours of flowers grown in pots by mixing a little dye with the mould. It now appears that Mr. Nesbit has discovered the practicability of dyeing cut flowers; if the stems be placed in a weak dye solution the desired effect may be obtained. It is noticeable that certain colours have no influence on the petals, while other compound colours are separated in the process of absorption, lilies treated with purple showing blue and red veins, etc.

The New Class-Subject, 'Elementary Science.'

(What to teach, and how to teach it.)

BY RICHARD BALCHIN.

WHEN the grand fact of the universal operation of Nature's great forces first dawned upon my mind, it produced a sort of revolution of ideas, exactly similar to that which I can see is taking place in the minds of the little fellows to whom those lessons are given. *My* grasping of the fact, however, took place at a much later period of life than is the case with those second-standard children. Still, the widely-open eyes and mouths, and all the signs of brain-working behind those little eyes, tell me plainly enough that the wonder-hunger is being ministered to, in *their* case, as it was in mine.

The 'work of ice' is an extremely interesting, instructive, and thought-awakening subject. There is enough material for a score of lessons; and if I were presenting the subject to adults, the course would certainly embrace that number of lectures. To our upper standards, six good lessons might well be given. But here in Standard II., we can but tread the threshold of the edifice; we may, however, excite a curiosity and a desire just to peep through the doorway and know a little of the wonders within.

The following is a reproduction, as far as I remember, of a lesson to the Second Standard, upon

'THE WORK OF ICE.'

Objects exhibited.—Picture of mountainous region with rugged peaks, glaciers, mountain torrents, and valley. If possible a view of the 'Vale of Chamounix' would be the best. A very small test-tube. A piece of lead water-pipe that has been burst during a frost, a piece of lead pipe with a hole bored in it; some ice or snow, and salt; and a basin.

Outline of Lesson.—(1) Show that ice *does* work, *i.e.*, a man boring a hole in a pipe does work; so if ice makes a hole in a pipe, *it* works. (2) Also, if a man is breaking stones in the road, he works; so if *ice* breaks up stones or rocks, it also works. (3) Again, if a man takes a file and with it files a piece of iron or stone or any other material smooth, we say the man works; so if ice grasps a file and makes anything even and smooth, then ice works. Instances of this ice-work may be given.

(Note.—If the children in the standard are above the average in general intelligence, the teacher may well make *three* lessons of this.)

THE LESSON.—I think, boys, I have told you what we are going to talk about to-day? Ans.—Yes, sir, ice. Ah, but what did I tell you we were going to say about ice? Ans.—That it does work. Very well; now look at this piece of lead pipe, what do you see? Ans.—A round hole in the side. How do you think the hole came there? Ans.—A man bored it. What makes you think it was a *man* that did it? Ans.—Because it is so round and smooth. What do you call that workman who does this kind of work? Ans.—A plumber. Now look at *this* piece of lead pipe. What do you see? Ans.—A hole. Do you think a workman made *that*? Ans.—No, sir. (A very rough but sharp boy, quick to recognise a fact.) 'Please, sir, it's bin an' busted; ours went like that last winter and all the water come a squirting out, it did.' Indeed?

Then, Jones, *you* know all about it. Tell us what made this hole in the pipe? Ans.—(Jones) The thaw 'busted' it. Say 'burst,' Jones; I will write the word on the board. Are you sure the thaw burst it? Ans. —Yes; because then the water squirted out. Do you think the hole was there before the thaw came? Ans. —It wasn't there before the *frost* came, I am sure of that. Ah! very likely; but you can be sure whether the frost burst the pipe or the thaw? Ans.—No. sir. Very well; we shall see directly which it was. Now, boys, you said that a workman made this round hole in the pipe, and of course when he was doing it, he was at work. Do you think that if, as Jones thinks, the water made this hole, we should say the water did work? Ans.—Yes, sir. And if we can say it was the *ice* in the pipe that made the hole, then what would you say? Ans.—The ice did work. (Another boy.)—*I* shouldn't call that *work*, because it's no good; we don't want it; it only spoils the pipe. Ah! but stop a minute. What did we say, last week, that a torrent of water sometimes did to houses and to bridges? Ans.— Washed them all away. Is it a good thing to have bridges washed away? Ans.—No, sir. Just so; but what *other* work did we see that the mountain torrent did? Ans.—It turned a water-wheel. Very well; then it appears that when the sun, or water, or ice does work, it does not stop to consider whether it is going to be useful to man or not. Still we must call it *work* whether we want it or not. But let us try and find out whether this hole in the pipe was the work of ice during the frost, or of water during the thaw. Here is a basin of broken-up ice and salt, mixed together; and here is a small glass tube—'test-tube' it is called; it is nearly full of water and corked up. I will put it down among the ice and salt, and move it about gently for a few seconds. There, come here, Smith, and tell us what has happened. Ans.—The water in the glass has frozen to ice! Anything else? Ans.—Yes, sir; look, the glass is cracked! Ah, so it is. Was the glass broken like that when I put the water in? Ans.—No, sir. How do you know that? You were not near enough to see. Ans.—The water would have run out. Why does not the water run out now? Ans.—Because it can't; it's ice. What shall I do if I want the water to run out? Ans.—Melt the ice. And if, when I melt the ice you see the water running out, would you say it was the water that broke the glass or the ice? (Here, Jones jumps up, holds up his hand, looks very sparkling and fiery—he has red hair), *I* can see all about the pipe 'busting' now. Say *burst*, Jones. Ans.—Burst. It was the frost that burst the pipe, but the thaw let us know it *was* 'busted.' (This is an instance of the difficulty we have in curing a bad habit. It is not, however, always advisable to interrupt a lesson with many corrections of this kind. It breaks the interest.) Ah! Now we are getting to it. Jones is right. So which shall we say: that the hole is the work of ice, or of water? Ans.—Of ice. Here is a piece of soft limestone. See, I pour on a few drops of water; there, it has disappeared! What has become of the water? Ans.— It has soaked into the stone. Very good. Here is a piece of white marble, polished. I pour a drop or two of water. Why does *this* water not soak into the stone? Ans.—It can't get in. But it found its way into the soft stone? Ans.—Yes; there's a lot of little holes in *that*. Very well. Suppose the water that is now in those little holes were to freeze; what then? (No answer.) Well, if instead of the little holes in the stone, suppose the water had frozen in a number of very small lead pipes? Ans.—All the pipes would have burst. Just so; and it is the same with all the little holes or pipes in the stone; *they* burst, and so the outer part of the stone is broken up into a very great number of small pieces, and in fact forms a dust upon the stone. Near this school, in the Graylands-road, a wall has been built of bad soft bricks, and soon after there has been a frost I can rub off a quantity of dust from the bricks. Can you think what it is has caused the bricks to go to dust in that way? Ans.— The wet soaks into the bricks and the water freezes. If I had one of those bricks here and were to pour a stream of water on to it, what would become of the dust? Ans.—It would be washed off. And if that forming of dust, and then the washing it off, were to take place over and over again, what would happen to the brick? Ans.—It would be all washed away in time. Yes, it might be so, but certainly we should find the brick getting smaller and smaller. Now, look at this beautiful picture. What are these? Ans.— Mountains. And what is all this white? Ans.— Snow. And do you know what this broad line of white represent? Ans.—A glacier; we had a lesson upon that; there are four glaciers in that picture. Yes, there are, I see. What do you call *this* part? Ans.—A valley. What are all those? Ans.—Peaks. What would you suppose these peaks were composed of? Ans.—Hard rock, stone. What kind of weather do you suppose the people have up here? Ans.— Very cold. What makes you think so? Ans.— Because there is so much snow and ice. Do you think they often have frosty nights in this part? Ans —Yes, often. I should think so, too; in fact, every night all through the year. Now, with all this wet and all this frost, what must be always happening to this rock? Ans.—It will be wearing away like the bricks. As quickly as the bricks? Ans.—No, sir. Why not? Because the rock is not so soft. You see those narrow, white streaks in various parts of the mountains, what are they? Ans.—Mountain streams. Yes; and what is this? Ans.—A waterfall. I have been on just such mountains as those, and once I saw a stream of water that was quite muddy; I put my hand in to get a stone, and then when the wet on my hand had dried up, my skin was covered with fine dust; I felt it quite gritty here between the fingers. Now, have you any idea where that dust came from? Answers (from many.)—From the rock. But how did it get here in the stream? Ans.—The water brought it down. Just so. But how came it away from the rock? Ans.—The frost. Very well. So these peaks, you see, must be getting smaller and smaller. Broken up by the frost, and then brought down by the streams into this valley. What is the work, then, that the ice is doing among these mountains? Ans.—Making them smaller and smaller. Breaking them up. Yes; this is the work of ice. It is just as much 'work' as that of a man who breaks stones in the streets. But there is yet more work, which the ice does. You say you have had a lesson upon 'Glaciers,' and we have several shown in this picture. What *is* a glacier? Ans.—A lot of ice coming down the mountain. Do you think you could see it move? (No answer.) Ah! I have walked upon glaciers. I have been on this one, here in the picture; it is called the 'sea of ice,' but I could not see it move nor feel it move, it went so

slowly. In what parts of the mountain do those glaciers move along? Ans.—In the places between the peaks. Well, what would you call those places? Ans.—Valleys. Yes; not so large as this valley at the bottom. If we call this one a *low* valley, what might you call those where the glaciers are? Ans.—High valleys. Do you know what these marks on the glacier are? I mean these short lines that run from side to side? Ans.—Yes, sir, they are cracks in the ice. What is this long dark line in the middle of the glacier? Ans.—A line of stones. And these at the sides? Ans.—Those are lines of stones, too. Very good; I am glad you remember so much of your lesson on glaciers. Do you think any of those stones ever get into these cracks? Ans.—Some of them will fall in sometimes. Yes, they often fall in. If we were to dig down to the bottom of this ice, what do you think we should come to? Ans.—The ground. What sort of ground? Ans.—Rock. Well, if some of those stones fell into the cracks to the bottom of the ice they would come to this rock; what would *then* happen to these stones? Ans.—They would stop there Ah! do you think they would really stop? What did we say all this ice was doing? Ans.—Coming slowly down. Well, if the ice is coming down and the stones are in the ice at the bottom, what must the stones do too? Ans.—They must come along with the ice. Just so; you see these stones are still in the ice, but at the bottom of it. Now if there was a large stone, half as big as this room, firmly fixed in the ice, what do you think this big stone would do to the rock as it passed over it? Ans.—Rub against it. And if we could see this rock after the stone had passed, do you think we should see where the stone had been? Ans.—Yes, sir. What makes you think so? Ans.—There would be a mark. What sort of mark? Ans.—A scratch. Like a scratch on your face after playing with the cat? Ans.—No, sir, much longer. Only longer? Ans.—Much deeper. Yes, and we should call such a scratch a 'groove.' And suppose instead of *one* stone, there were thousands of them all grinding at the rock and making grooves, what would happen to the rock in course of time? Ans.—It would get worn away. Just so; then see what a work this glacier is doing. (A boy.)—Please, sir, would that be work? Well, suppose your father wanted to make a piece of iron smooth, what would he do? Ans.—File it. And would that be doing work? Ans.—Yes, sir. Well, what is the glacier doing to the rock? Ans.—Filing it smooth. Very good. I will write on the board the work of ice:—'Ice breaks up rocks and makes mountains smaller; and ice grinds along valleys and makes them deeper.'

(To be continued.)

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Notes on Bacon's Essays.

BY FRANCIS WATT, M.A.

ESSAY LI.—OF FACTION.

SUBSTANCE.

FACTIONS or parties are something apart from good government. Men usually employ them for their private ends. When one faction succeeds in conquering its opponents, it generally splits up. Examples from history. Kings ought not to side with factions.

respect of factions, taking note of how parties stand to each other and to him.

principal part of policy, one of the chief things in politics.

chiefest, observe the double superlative.

ordering those things which are general, seeing as to matters that undoubtedly concern the general public weal.

in dealing with correspondence to particular persons, one by one, we ought to frame our mode of action according to the particular case and person.

mean men, men low in position (A. S. *maene*; mean = average is quite a different word, and is from Fr. *moyen*).

adhe e, take a side, attach themselves.

great men were better, it would be better for great men.

to maintain themselves, etc., to hold themselves aloof from too close connection with one party.

yet even in beginners, and even in the case of men who are nobodies, and so obliged to attach themselves to others; it is better to join a moderate party, which is least offensive to its opponents.

most passable, most agreeable.

giveth best way, affords the best means of rising.

in conjunction, the members are joined together most strongly.

a few that are stiff, in political parties especially, the most determined and extreme usually won the others; so it was in the French Revolution.

Lucullus, Lucius L. Lucullus (B.C. 115-57), Roman Consul, opponent of Pompey and Cæsar, and the leader of the aristocratic party.

optimates, the best, *viz.*, in position.

brake (archaic form of 'broke'), dissolved their political alliance.

Antonius, etc., the party of Mark Antony and Augustus, against Brutus and the other conspirators who had killed Cæsar.

seconds in faction, holding a subordinate division in the main body, they become the chiefs of one of the subdivisions.

prove ciphers and cashiered, they are of no use in the new circumstances, and are dismissed (cashiered, Fr. *casser*, to break).

faileth, stops, is at an end.

placed, in secure possession.

take in, ally themselves.

belike, in all likelihood.

purchase, acquisition.

lightly goeth away with it, easily succeeds in his purpose. Observe that *it* represents no noun or clause previously expressed.

the receiving, the acquisition.

casteth them, determines which shall have the victory.

the even carriage, conducting oneself impartially.

proceedeth not always of moderation, is not always due to moderation.

end, intention.

suspect, suspicious.

padre commune, common father.

to refer all, to let all his actions be ruled by this idea.

side themselves, join themselves.

paramount, superior; so lord-paramount.

tanquam unus, and as one of us.

The League.—The Holy League, formed by the Guises against the Huguenots. Henry III. joined it, but in 1588 it was directed against him, and he was driven from Paris.

proper motions, their own motions.
Primum Mobile.—This was a term of the Ptolemaic system of astronomy. According to this system the earth was the centre of the universe. The heavenly bodies revolved round it with various motions, and at various rates. There were various spheres or heavens. The last was the tenth, and whatever motions the other spheres had they all joined in the motion of this the *primum mobile*, or first moveable, that carried all round the earth every 24 hours.

ESSAY LII.—OF CEREMONIES AND RESPECTS.

SUBSTANCE.

VIRTUE if unadorned must be very great, or it attracts no notice. Good-breeding consists in a number of small particulars. Some observations as to how we ought to conduct ourselves to others.
real, plain, without grace of manner.
foil, 'a term used in jewellery to denote either the thin leaf (Fr. *feuille*, L. *folium*) of metal placed under precious stones to increase their brilliancy, or something of another colour near which jewels were set so as to increase their brilliancy by contrast' (Lewis).
light gains make heavy purses. So our trade maxim, 'Small profits and quick returns.'
come thick, are frequent.
in note, under notice.
festivals, on special occasions.
Queen Isabella of Castile, wife of Ferdinand of Aragon (1451-1504).
good forms, good manners; so in modern slang a thing is said to be not 'good form.'
so shall a man observe them in others ('shall' where we should say 'will,') the best way to become well-mannered is to let the best examples quietly instil themselves into our minds.
labour too much, is too formal.
comprehend, take hold of.
breaketh his mind, is of a petty disposition.
observations, observances.
again, in return.
himself, we should say 'oneself.'
formal natures, people that stand much on ceremony.
above the moon, extravagantly.
is, note again singular verb though it has two subjects.
imprinting, impressive.
singular use, special use.
peers, equals (L. *par*).
shall be = will be.
state, dignity.
that is too much, that exaggerates.
to apply one's self, to be civil and serviceable.
upon regard and not upon facility, we ought to make it plain that we are complaisant from respect (*regard*) and not from servility (*facility*).
as, for instance.
one's own—to use *one's own*, and then *your*, when the same person is meant, as Bacon does here, would be now thought a faulty mode of expression.
motion, proposition.
condition, some change.
allow, approve of.
too perfect in compliments, flatterers.
attribute, character.
respects, deference.
curious, exact, careful.
He that, etc., Eccl. xi. 4.
point device, very exact, said to be derived from the name of a lace very finely wrought.

ESSAY LIII.—OF PRAISE.

SUBSTANCE.

PRAISE is often false. The best kind of praise is that in which both the better classes and the common people concur. Various kinds of praise considered and discriminated. A man may not praise himself with propriety, but he may his office.
glass or body, the nature of a mirror greatly affects the image of the thing seen by means of it.
naught, worthless.
admiration, wonder.
species virtutibus, etc., appearances resembling virtue.
fame is like a river. This statement is too wide. It is *not* the worthless trifles which, as a rule, are known to posterity.
quality, high birth.
concur, are of the same opinion as the common people.
nomen bonum, a good name is like sweet-smelling ointment (Eccl. vii. 1).
will not easily away, i.e., go away; a mark of a good scent is that it lasts.
points of praise, particulars or reasons for which a man is praised.
suspect, something suspicious.
of, from.
certain common attributes which may serve every man, some general terms of flattery which are applicable to everybody.
follow, be guided by.
look, note, observe.
out of countenance, conscious of his own demerits.
perforce, without regard to truth or reason.
spreta conscientia, in spite of conscience.
come of, arise from.
respects, regards.
laudando præcipere, by praising to teach.
stir, excite.
pessimum genus, etc., the worst species of enemies are those who praise, altered from the life of Agricola by Tacitus, the Roman historian.
push, pimple.
opportunity and not vulgar, on a fit occasion, and with delicacy.
He that praiseth, Proverbs xxvii. 14.
decent, becoming.
cardinals, those who elect the pope, an office of high dignity in the Roman Church, though the holder is not necessarily a priest.
which, formerly applied to persons. 'Our Father which art in heaven.'
theologues, theologians.
civil, as distinguished from ecclesiastical.
embassages, embassies.
shirrerie, explained in the text as 'under-sheriffries,' a low law business.
catchpoles, a contemptuous name for the lower officers of the law, whose duty it is to apprehend criminals, and drag them to prison.

speculations, theological subtleties.
interlace, interject.
I speak, etc., 2 Cor. xi. 23.
magnificabo apostolatum, 'I shall magnify my apostolic office.'

ESSAY LIV.—OF VAINGLORY.

SUBSTANCE.

WHILST vainglorious persons are factious, violent, and noisy, yet there is a sort of vainglory, though it is more properly magnanimity, which is useful alike in civil and military matters and in learning. Some examples of this from antiquity. Some remarks on boastful men.

it, viz., the fable.
prettily devised of, wittily invented by.
goeth alone, moves of itself.
upon greater means, on account of causes greater than they can command.
carry it, are the cause of it.
glorious, boastful.
factious, partial, siding with a faction.
bravery, boasting, bragging.
stands upon, is founded on.
not effectual, they cannot be effectual, or work effectually.
bruit, cry, noise, so much cry, little wool.
civil affairs, politics, where men are governed a good deal by reputation and report (*opinion* and *fame*).
Titus Livius, Livy, the Roman historian, who is frequently quoted by Bacon.
Antiochus and the Ætolians. 'The reference is to Antiochus the Great, King of Syria. After the close of the Punic Wars, he was visited at Ephesus by Hannibal (B.C. 192), then a fugitive, who did all he could to persuade him to hostilities with Rome. At the same time the Ætolians sent envoys to Antiochus, urging him to interfere in the affairs of Greece, and the lying words of Thoas, their messenger, caused him, against the advice of Hannibal, to invade Greece, and this led to the disastrous defeat of Magnesia (Liv., Book XXXV., cap. xii.).' (Lewis.)
cross lies, opposite, contradictory lies.
to draw them, to induce them.
interest than he hath in either, influence than he has with either.
hands, ways.
breed opinion, give reputation.
glory, bragging.
upon charge and adventure, necessitating great cost and hazard.
composition, mixture.
in fame of learning, great writers are excited to do their best by the hope of fame, which Milton calls the last infirmity of noble minds.
Qui de contemnenda, etc. 'Those who write books on despising glory inscribe their own names therein.'
Socrates (B.C. 466-399), the great Athenian philosopher already referred to.
Aristotle (B.C. 384-322), the pupil and rival of Plato. He was tutor to Alexander the Great. His writings embrace almost the whole field of human knowledge.
Galen (A.D. 131-200), Claudius Galen, a very famous physician, who practised at Rome under the protection of the emperor Marcus Aurelius. During the middle ages he was regarded as a well-nigh infallible authority.
ostentation, humility was considered rather a vice than a virtue by the ancients.
beholden, indebted.
as, that. Bacon means that if a man does not exhibit plainly his own virtue, his friends will not be too anxious to give him credit for it.
his, its.
Cicero, Marcus Tullius Cicero (B.C. 106-43), the great Roman actor.
Seneca, an eminent Roman philosopher and orator of the Stoic school, who committed suicide when condemned for conspiracy, A.D. 65.
Plinius Secundus. Pliny the Younger flourished during the first century A.D. He wrote a famous report to the Emperor Trajan on the Christians and their worship.
her age, the age of Fame, which is here (as in Lat. *fama*) feminine.
seelings, wainscottings.
Tacitus doth attribute to Mucianus. Tacitus, the Roman historian; Mucianus, a Roman general and orator, Governor of Syria (A.D. 69). He showed a special art in all he said or did is the meaning of the Latin.
proceeds not of, does not arise from.
gracious, graceful.
excusations, cessions, apologies, yieldings.
you much less, you are much less to be discriminated than he is.
glorious men, bragging men.
parasites (Gr. *para*, along with, and *sitos*, food). They who take food with another, flatter for the sake of food or some other advantage to themselves.

ESSAY LV.—OF HONOUR AND REPUTATION.

SUBSTANCE.

How we may gain real honour. The various degrees or grades of honour, with examples.

affect, pretend to.
inwardly, really, in truth.
contrariwise, on the contrary.
darken their virtue, etc., do not make plain the virtues that really exist in them, so that they are estimated below their true value.
good circumstance, in such a striking manner.
temper, manage, suit.
as in some are, etc., that each of them in turn pleases a certain part of the people.
the music will be the fuller, his actions will be thought the more of.
ill husband, a bad manager.
broken upon another, got by outstripping another or depressing him.
the quickest reflection, the most sparkling appearance.
cut with facets, cut into separate sides or faces.
in their own bow, in outstripping them in their own peculiar line of excellence.
omnis fama, etc., 'all fame is from domestics,' so Cicero.
a man's self in his ends, by making it appear that merit, not fame, is the real end pursued.

marshalling, ordering.
are there. Marshalling, to which *there* grammatically belongs, is singular, but Bacon is thinking of *degrees*, hence he uses the plural.
conditores imperiorum, founders of states.
Romulus, the mythical founder of Rome.
Cyrus, the half-mythical founder of the Persian Empire, whose exploits form the subject of Xenophon's 'Cyropædia.'
Cæsar, Julius Cæsar, who brought the republic to an end, and may be said to have founded the Roman Empire.
Ottoman, the founder of the Turkish Empire, hence still called the Ottoman Empire.
Ismael, of Persia; see Essay XLIII.
legislators, lawgivers.
perpetui principes, perpetual princes.
Lycurgus, a famous Spartan lawgiver, flourished about the 9th century B.C.
Solon, one of the seven Grecian sages, a famous Athenian lawgiver.
Justinian (A.D. 483-565), the famous Roman Emperor of the East. Under him the Roman law was codified.
Edgar, or Eadgar, as Bacon did, and as we now again spell the name, called the Peaceful, ruled in England in the 10th century; is reported to have been a wise and able ruler.
Alphonsus of Castile (1221-1284), Alphonso X. of Castile, caused to be compiled an abstract of the Spanish law, called the *Siete Partidas*, or seven parts.
liberatores or salvatores, liberators or preservers.
compound, relieve their country from.
Augustus Cæsar. See Essay XLII.
Vespasianus (A.D. 9-79), a Roman emperor and famous warrior. Jerusalem was destroyed during his reign.
Aurelianus (212-275), a Roman emperor, who did much to restore the greatness of the empire by expelling the barbarians from Italy, and reducing to order the more distant parts of the empire.
Theodoricus (455-526), founder in Italy of the kingdom of the Ostrogoths.
Henry the Seventh of England (1485-1509), did much to increase the royal power.
Henry the Fourth of France, (see Essay XXXIX.), with the aid of Sully, his wise prime minister, did much for the prosperity of France.
propagatores or propugnatores imperii, extenders of, guardians of the empire.
patres patriæ, fathers of their fatherland.
participes curarum, sharers of cares.
discharge, intrust.
duces belli, leaders in war.
scantling, small measure or bounds.
negotiis pares, able to do their duty or business.
sufficiency, competency.
M. Regulus. Marcus Regulus was made prisoner by the Carthaginians, and sent by them to Rome with orders to negotiate a peace. If he failed he was bound to return to them. He advised the Romans to continue the war, and returning to Carthage was put to death with great torture.
the two Decii, father and son, both Roman consuls, who, in wars with the Samnites and Gauls, sacrificed themselves to gain the victory for their country.

ESSAY LVI.—OF JUDICATURE.

SUBSTANCE.

THE duty of a judge is to interpret, not to make the law. He ought to be learned, reverent, cautious, and of undoubted integrity. His relations towards suitors, advocates, officers of court, and to the state considered.

jus dicere, and not jus dare, to state, not to make law.
authority claimed by the Church of Rome, viz., to be infallible.
stick, hesitate.
by show of antiquity to introduce novelty, pretending that some gloss of their own is old, they give it a spurious claim to respect.
witty, clever, ingenious.
plausible, courting applause.
advised, heedful, cautious.
portion, part.
cursed with the law, Deut. xxvii. 17.
mere stone, a boundary stone (A.S. *gemære*, a boundary).
capital, chief.
a foul sentence, etc., a bad principle is thus laid down which is capable of great and hurtful application.
fons turbatus, etc. 'A righteous man falling down before the wicked is as a troubled fountain and a corrupt spring.'
there be, saith the Scripture, Amos v. 7.
close, hidden.
contentious suits, suits about trifling matters, and such as ought never to have been brought into court.
as God useth, is accustomed (Isaiah xl. 3, 4, etc.).
a high hand, disposition to violence.
great counsel, able advocates.
Qui fortiter, etc. 'Who wrings the nose much, brings forth blood' (Prov. xxx. 32).
torture of laws, twisting the law so that it has a meaning it was not intended to have.
for terror, a means of deterring.
rigour, cruelty.
Pluet super, etc., 'He shall rain snares upon them' (Ps. xi. 6).
pressed, strained, executed with excessive rigour.
if they have been sleepers of long, if they have fallen into desuetude.
confined in the execution, put into force in a limited manner.
Judicis officium, etc., it is the duty of a judge to look not only at the facts, but also at the times, viz., circumstances of the case.
severe eye upon the example, whilst condemning the sin, to have mercy upon the sinner.
conceit, conception.
prevent, anticipate.
impertinency, that which is not to the point, irrelevant.
glory and willingness, vanity and fond desire.
stayed and equal, stately and continuous.
representeth the proud, James iv. 6.
noted, well-known, evident.
by-ways, a secret and bad way. So in Essay XI., 'Of Great Place,' we have, 'a by-way to close corruption.'
gracing, compliments.
fair, properly.
obtaineth not, loses the case.
the conceit of his cause, the unreasonable belief he had in the goodness of his cause.
civil reprehension, moderate and dignified rebuke.

chop, bandy words, as to chop logic; chop is to change, as a chopping sea.
foot pace, raised platform.
purprise, enclosures, much the same as precincts.
grapes, as the Scripture saith, Matt. vii. 16.
polling, plundering.
court swell and the country pine, litigation, however necessary, produces nothing. It should therefore be kept within the smallest possible limits, lest too much of a country's strength be drained away in this profitless manner.
quarrels of jurisdiction, disputes as to the limits of the court's authority.
not amici curiæ, but parasiti curiæ, not friends, but parasites of the court; a friend of the court, *amicus curiæ*, is one who, though himself apart from the cause, interferes to give the judge some new and important information.
poller, plunderer.
weather, storm.
ancient clerk, an old man who has spent his life in the service of the court.
Salus populi. The safety of the people is the highest law. The *Twelve Tables* were a code of early Roman laws issued by the Decemvirs (B.C. 451), who for a short time ruled Rome. This maxim is not from them, but from Cicero's treatise *On Laws*, iii., 3, 8.
they be in order to that end, unless they are designed so as to help the great end of the public weal.
things captious, such as snares are.
oracles not well inspired, oracles on whose responses we cannot depend.
intervenient in, mingled with.
deduced, brought or referred.
meum and tuum, etc., mine and thine. The matter itself may be a small and private one, but it may have issues that affect the public weal (trench to point of estate).
spirits and senses, mind and body.
Solomon's throne is described in 1 Kings x. 19, 20, as surrounded with lions.
lions under the throne, being circumspect, etc., that their decisions do not trench on the king's power.
Nos scimus, etc., we know that the law is good, if a man use it lawfully. In reading this essay it is well to remember that in 1621 Bacon was charged with bribery and corruption. He confessed his guilt, and was degraded from his post as Lord Chancellor.

ESSAY LVII.—OF ANGER.

SUBSTANCE.

ANGER, though it cannot be extinguished, may be ruled by correcting its hurtful effects and its baseness. Conciliation and time will repress it in us. How it may be raised or appeased in others.

bravery, bravado, empty pretence.
Stoics, a sect of Grecian philosophers who took their rise in the 3rd century B.C. The name is from the *stoa poikile*, or painted porch, a building at Athens where the sect met. The Stoics inculcated a certain calmness and indifference to the ills of life. Their philosophy was congenial to the Roman character, and many of the best Romans, both during the Republic and Empire, belonged to this sect.
better oracles, viz., the Bible.
Be angry, etc., Eph iv. 26.
race and time, course and duration.
attempered, toned down.
particular motions of anger, the angry notions and feelings.
refrained, restrained.
anger is like ruin. 'Ruin is here used in the sense of the Latin *ruina*, a falling building or other object' (Storr).
upon that it falls, upon that on which it falls.
to possess our souls, Luke xxi. 19.
animusque in, etc., and 'leave their lives in the wound.' From Virgil's 'Georgics.'
carry their anger, etc., are angry rather in a scornful than in a timid manner.
give law to, rule or command.
too sensible, too easily offended.
tender and delicate, in mind.
apprehension and construction, 'recognition and interpretation.'
circumstances of contempt, imagined slights.
of the touch, of the attacking and injury, the notion that our reputation is assailed.
Gonsalvo, called the Great, a Spanish general of the 15th century. He defeated the Moors in Spain and the French in Italy. He finally fell into disgrace and died at Grenada, 1515.
telam honorisc, a thicker covering for his honour.
to still himself, to quiet himself.
to contain, to restrain.
aculeate and proper, biting and well aimed.
communia maledicta, general terms of reproach. Men are not much offended if included in the general terms of malediction which an angry man utters.
act anything that is not reasonable, do anything that you cannot recall.
frowardest and worst disposed, most testy, and in the worst humour.
to relate to a man an angry business, when a man is in a good humour, then is the time to brook a disagreeable subject to him.
construction of the injury from the point of contempt, show that the injury has not been done because the man is despised—do not add insult to injury.

ESSAY LVIII.—OF VICISSITUDE OF THINGS.

SUBSTANCE.

ALL knowledge is but remembrance of that which has already existed. Oblivion is wrought more by deluges and earthquakes than by conflagrations and droughts. It may be that a complete revolution of all the heavenly bodies will cause the order of things to recommence. Vicissitudes amongst men caused by riots and wars.

Solomon saith, Eccles. i. 9.
Plato had an imagination, Plato the Athenian philosopher, had a theory that all our knowledge is but a dark reminiscence of the *ideas* implanted in our soul in a better and earlier period of existence. So Wordsworth:—

'Our birth is but a sleep and a forgetting.'

sentence, opinion, belief.
Lethe, in the classical mythology, one of the rivers of the

lower world. Whoever drank of it forgot all his past existence.

runneth as well above ground, in the upper world all is also forgotten.

diurnal motion perpetually keepeth time, the motion of the heavens, or rather the action of the earth which causes this apparent motion, is always accomplished in twenty-four hours.

the matter is in a perpetual flux, all fleets is the doctrine of Heraclitus of Ephesus, and other ancient philosophers.

merely, entirely, quite (L. *merus*, pure, unmixed).

Phaeton's car. Phaeton was the son of the sun. He drove his chariot for a day, but so badly that Jupiter, to stop the damage he was causing, killed him with a thunderbolt.

Elias, 1 Kings xvii. 1.

particular, confined in area.

West Indies, America, of which as yet much remained to be discovered.

hap, happen, chance.

mountainous people, mountaineers.

is all one, is the same as.

Atlantis. In Plato's 'Timæus' there is an account given as related to Solon, the Grecian sage, by an Egyptian priest, of an island in the western seas, called Atlantis. On account of the wickedness of its inhabitants, it was sunk beneath the waves of the sea.

on the other side, on the other hand.

pouring, discharging so much water.

as, that.

Machiavel, see Essay XXXIX.

Gregory the Great (544-604), a pope who was bitterly opposed to the cultivation of the old pagan arts and literature.

Sabinian was the successor to Gregory in the papal chair.

superior globe, the heavens.

Plato's great year. In Plato's 'Timaeus' the theory is stated that after a great number of years (from 12,000 to 25,000), after the beginning of things, all would return again to the same order as at first.

fume, mere idle opinion.

gross, generally—the same individuals will not begin again the same life, but generally the state of things will repeat itself.

waited upon, watched.

respective effects, what special class of effects are connected with the appearance of a special comet.

version, direction.

placing, position.

toy, trifle.

Low Countries, the Netherlands.

suit, sequence, succession.

comes is singular; *kind* and *suit*, its subjects, are taken as forming one idea.

the rather mention, the sooner mention; 'rather' is the comparative of the obsolete *rathe*, soon, early. Cp. Milton:—

> 'Bring the *rathe* primrose that forsaken dies.'

some concurrence; Bacon's observation led him to think that there was some truth in the statement.

doubt, fear (L. *dubito*.)

extravagant, wandering. Cp. 'Hamlet': 'the extravagant and erring spirits.'

all which points held, all these things were actually so.

Mahomet, the Arabian prophet and founder of the religion called after him (A.D. 570-632).

speculative heresies, mere theoretical speculations.

Arians, who flourished in the 4th century, denied the divinity of Christ; called after their founder, Arius.

Arminians, the followers of Jacob Harmensen (L. form *Arminius*), 1560-1609, who opposed the Calvinistic doctrine of predestination.

work mightily upon men's wits, they change men's opinions, but not their mode of conduct.

civil occasions, political events.

superlative and admirable, very great and wonderful.

compound the smaller differences, make up trifles.

take off the principal authors, remove the chiefs.

seats or stages, sites.

Gallo-Graecia, a province of Asia Minor, the Galatia of the New Testament.

have no certain points of heaven, places are not east and west in themselves, but only so in relation to other places.

Almaigne, Germany.

Charles the Great, the Emperor Charlemagne, King of the Franks, and Emperor of the West (742-814.)

except they have means to live, unless they have a reasonable prospect of being able to support themselves and their families.

it hardly falleth under rule, the fact is not of such a nature as to be methodized.

ordnance, cannon; there is no authority, as it would appear, for the statement that follows, though it is supposed to refer to the wars of Alexander the Great.

fetching afar off, carrying, and so striking at a great distance.

outruns the danger, anticipates the danger, is beforehand with the enemy.

arietations (L. *aries*), battering with the ram.

extremely, very much.

pointing, appointing.

battles, armies, or bodies of forces. See Bacon elsewhere, 'The king divided his army into three battles.'

competent than vast, quality rather than quantity.

they grew to, they took note of, and attached importance to.

ordering of their battles, arranging their armies.

his, its.

solid and reduced, compact and exact.

philology, history, literature.

SUBMARINE VOLCANO.—An interesting letter from Captain Edw. Ashdown, of the P. and O. steamer *Siam*, appeared in *The Times* lately; he says that his ship, when on her way from St. George's Sound to Colombo, while in lat. 6° S., long. 89° E., passed through a large quantity of lava for more than four hours, the lava extending as far as could be seen. As a strong current of from fifteen to thirty miles a day was setting eastward from Sumátra (700 miles off), which was the nearest land, it would naturally appear as if the lava proceeded from some submarine volcano near by. The captain reminds his readers that an eruption of such a volcano actually occurred near the spot in 1789.

Recent Inspection Questions.

[The Editor respectfully solicits contributions—all of which will be regarded as STRICTLY PRIVATE*—to this column. For obvious reasons, it cannot be stated in which district the questions have been set.]*

Arithmetic.

STANDARD I.

A.	B.	C.
2130	1854	9219
109	365	550
55	7050	8976
9019	900	54
11313	10169	18799
1860	4011	4120
395	29	3318
1465	3982	802
1001	3450	500
16	924	27
985	2526	473

STANDARD II.

W. (1) Divide 88,520 by 11. Ans. 8047+3.
(2) Multiply 90,409 by 207. Ans. 18,714,663.
(3) From 90,000 take 11 doz. Ans. 89,868.
(4) If I have 500 nuts, and give to one boy and 3 girls 74 each, how many will be left? Ans. 204.
(5) A dozen dresses require twelve score buttons. How many buttons will be wanted for 2 dresses? Ans. 40.

X. (1) Multiply 90,123 by 89. Ans. 8,020,947.
(2) Divide 70,619 by 9. Ans. 7846+5.
(3) From 15,050 take 729. Ans. 14,321.
(4) How many apples may I eat every day out of a store of 80, so as to have 17 left at the end of 9 days? Ans. 7.
(5) A farmer sold 500 lambs on Monday, half as many on Tuesday as he did on Monday, and 900 on Wednesday. How many lambs did he sell in all? Ans. 1650.

Y. (1) From 90,019 take 7070. Ans. 82,949.
(2) Multiply 97,805 by 370. Ans. 36,187,850.
(3) Divide 62,806 by 8. Ans. 7850+6.
(4) It takes a man 16 hrs. to make a gate. How many hours will it take to make 5002 gates? Ans. 80,032.
(5) If I have 1000 marbles and give 48 each to 8 boys and 3 girls, how many will remain? Ans. 472.

STANDARD III.

J. (1) From £352 0s. 1½d. take £69 17s. 4d. Ans. £282 2s. 9½d.
(2) 13 cows cost £12 17s. each, 29 sheep cost 33s. each. How much must be paid for all? Ans. £214 18s.
(3) Multiply £3792 12s. 6d. by 14. Ans. £53,096 15s.
(4) Seven men have £1505 10s. 5d.; one takes £976 12s. 2d., and the others divide the rest equally among them. How much did each of the others get? Ans. £88 3s. 0½d.
(5) Divide £205 12s. 7½d. by 6. Ans. £34 5s. 5¼d.+5.

K. (1) Multiply £70,509 10s. 0¾d. by 18. Ans. £1,269,171 1s. 1½d.
(2) 36 men earn 18s. a week each for 27 weeks. How much will be required to pay them? Ans. £874 16s.
(3) Add £309 12s. 2d.; £7520 10s.; £32,965 9s. 4¾d.; and 13s. 4½d. Ans. £40,796 4s. 11¼d.
(4) How many farthings in £29 14s. 3½d.? Ans. 28,526.
(5) From £900 0s. 3¾d. take £796 10s. 10¾d. Ans. £103 9s. 5d.

STANDARD IV.

(1) £91,064 13s. 4d.÷271. Ans. £336 0s. 7½d.—190.
(2) £336 0s. 11¼d.×78. Ans. £26,211 13s. 1½d.
(3) Reduce two hundred thousand six hundred feet to furlongs. Ans. 303 fur. 37 pl. 3 yd. 6in.
(4) If a father's wages are 6s. 3d. a day, and a son's 8s. 3d. a week, how much does the father earn more than the son in 24 working days? Ans. £5 17s.

STANDARD V.

(1) If 1 lb. cost 4s., what will 1½ ozs. cost? Ans. 4½d.
(2) Find the cost of 27 gals. 2 pts. 2½ gills at 3s. 4d. per quart. Ans. £18 4s. 4½d.
(3) A lady ordered her grocer to send to 20 poor people, each 3 lbs. sugar at 4½d. per lb.; 4 ozs. tea at 4s. 8d. per lb.; 4 lbs. currants at 4d. per lb. What was the amount of her bill? Ans. £3 12s. 6d.
(4) The cost of 1¼ cwt. at 10½d. per lb. Ans. £6 2s. 6d.
(5) A joint of meat cost 14s. 7¾d. at 9½d. per lb. What was its weight? Ans. 18½ lbs.
(6) Find the value of 1 ton 8 cwt. 8½ lbs. at 5½d. per lb. Ans. £72 1s. 2¾d.
(7) Find by Practice the value of
92 at 3½d. each. Ans. £1 6s. 10d.
49½ at 7½d. each. Ans. £1 10s. 11¼d.
765 at £2 0s. 4½d. each. Ans. £1544 6s. 10½d.
1 bushel at 9s. 10d. per qr. Ans. 1s. 2¾d.
3 cwt. at 1s. 6d. per lb. Ans. £25 4s.
9 tons at 3s. 4d. per qr. Ans. £120.

STANDARD VI.

(1) If 13 men do a piece of work in 9 days of 7 hours each, how many hours a day would it take 91 men to do it in one day. Ans. 9 hours.
(2) $\frac{1}{12}$ of a man's income goes for rent, $\frac{5}{91}$ for taxes. If these two sums amount to £17, find his income. Ans. £182.

Grammar.

STANDARD V.

Parse and analyse:—'My stockings there I often knit.'

Domestic Economy.

STAGE II.

1. What are the materials used in clothing?
2. Why is it beneficial to use flannel?

Notes of Lessons on the Seasons.

No. II.—DIFFERENT HEIGHTS OF THE SUN IN SUMMER AND WINTER.

BY JOSEPH H. COWHAM, F.G.S.,
Normal Master, Wesleyan Training College, Westminster.

INFORMATION.

(1) Revision of last lesson :—

The heat of summer is partly due to the many hours the sun is shining each day, whilst the cold of winter is largely due to the few hours the sun is above the horizon.

Temperature is not entirely dependent upon the length of time the sun is above the horizon. The other condition which chiefly causes the change of seasons is *the different height the sun attains in summer and in winter.*

Obvious differences of elevation the sun attains in summer and in winter.

(1) The sun's course at midday is much higher in June than in December.

(2) In June the sun rises over 60° at noon above the southern point of our horizon. (See Fig. 1.)

(3) In winter the sun does not rise higher than 15° above the same point at noon. (See Fig. 1.)

Mode of representing the sun's course at different seasons.

In fig. 2 the earth is supposed to be placed in the centre of a hollow sphere. This hollow sphere is the heavens. The plane of the horizon divides this hollow sphere into two halves. The upper half is supposed to be in the sunlight.

In the latitude of London the Pole Star is $51\frac{1}{2}$° above the northern horizon, and the equinoctial is $38\frac{1}{2}$° above the southern horizon.

TEACHING NOTES AND ILLUSTRATIONS.

The reason for these differences was given in the lesson printed in the October number of the PRACTICAL TEACHER. Emphasise the fact by finding from an almanack the actual length of day at midsummer and midwinter.

This truth would be seen from the fact learned last lesson, that at the Pole the sun shines for six months of the year continuously without freeing the Polar regions of ice.

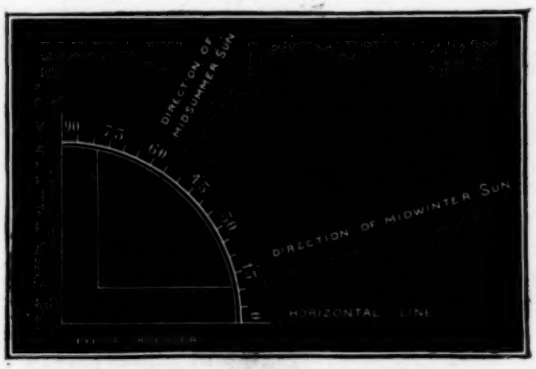


Fig. 1.

The different altitudes would be subjects of observation by senior scholars any midday about June 21 and Dec. 21.

A knowledge of 1st Grade Geometry would enable them to make simple apparatus, as Fig. 1, by which the sun's altitude could be measured.

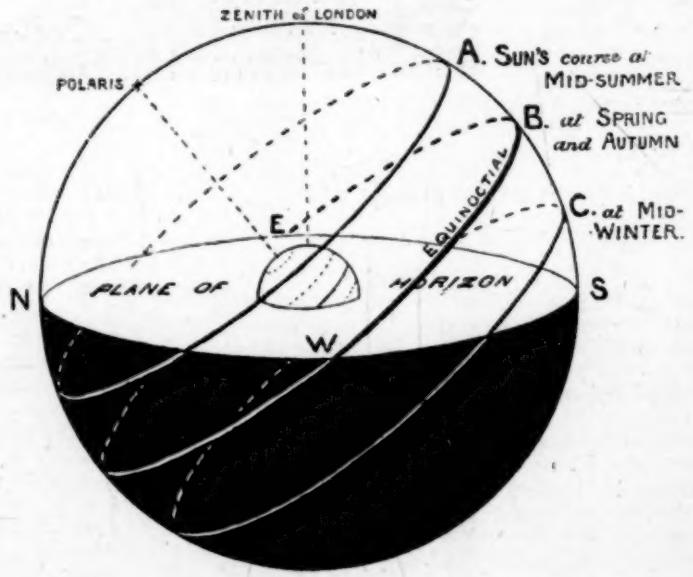


Fig. 2.

Three courses taken by the sun and represented in the diagram.

(1) On March 21st and September 22nd the sun is on the equinoctial. Its course will be along the middle curve (B. Fig. 2).

N.B.—The sun rises on these days exactly in the east and sets in the west point of the sky.

(1) It will add interest to this fact if the class recall the mode of finding E. and W. on other days of the year.

(2) At midsummer the sun rises $23\frac{1}{2}°$ north of E. At noon he reaches $62°$ above the southern horizon (at A. Fig. 2), and sets $23\frac{1}{2}°$ to the north of west.

(2) This course is represented by the uppermost curve (A) in the diagram. It might be shown to coincide with the Tropic of Cancer on a terrestrial globe.

(3) At midwinter the sun rises $23\frac{1}{2}°$ south of E. At noon he reaches only an altitude of $(38\frac{1}{2}—23\frac{1}{2})$ 15° (at C. Fig. 2), and sets $23\frac{1}{2}$ south of west.

(3) Draw the lowest curve (C) on the diagram. This course also coincides with a circle drawn on the terrestrial globe. The class might be allowed to find the circle for themselves, and give its name.

Relation of sun's height to the amount of heat received.

(1) When the sun is rising in the early morning, or setting at night, the heat received is much less than at midday.

These facts are open to daily observation by every English boy.

(2) The more nearly the sun reaches the zenith of an observer, the more powerful is the heat.

Reference to the heat of the Tropics furnishes an example of this fact.

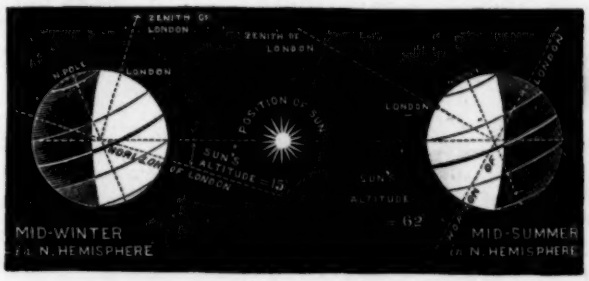


Fig. 3.—Diagram showing that the different elevations of the sun at June and at December are due to the earth taking up a position on opposite sides of the sun, and to the axis of the earth keeping a constant direction.

Friedrich Fröbel.

BY HIS PUPIL, HEINRICH HOFFMANN.

V.

FRÖBEL had a great dislike for 'private lessons:' he abhorred the fragmentary, broken, unconnected scraps of knowledge which they commonly supply. He knew, however, how to avoid that danger. He took his pupils out with him in daily rambles through field and wood, and gave to his lessons an ever-varied and pleasant background. When the family tutor resigned his office, Fröbel was asked to look about for an efficient substitute; and as this proved to be a task of considerable difficulty, the vacant place was offered to Fröbel himself.

The proposal startled him, and well it might. Hitherto he had been looking upon *teaching* as the highest aim of his life; now the veil was removed from his eyes, and the conviction was forced upon him that that was but a means to a still higher aim—to *training*. Hitherto he had considered training as centreing on himself and his own development; now he had to regard it in its reflex influence, and the application of the results of his own self-education to the development of others was to stand as a foremost problem in his thoughts. However, after a hard struggle, he accepted the offered post, filled his place at Gruner's with an able substitute, and entered upon his new duties in July, 1807. But not without making some rather characteristic conditions did he sign the agreement. One was that he should have full authority to act just as he pleased, and to carry out his own plans without any interference; and another

was that he might be allowed to retire with his pupils to the family country-seat, there to live with them far from any undesirable influences of an artificial town life, in a pure atmosphere, beneficial to both body and mind. These conditions were readily granted, and so they removed to 'Auf der Oede,' near Frankfort. Here they enjoyed the most favourable conditions for a sound education: physical exercises in a pure air; most instructive rambles in field, and wood, and uplands; and the total absence of any contaminating influences.

And Fröbel was indeed not only their teacher—he was entirely their associate; he shared with them all the work in field and garden, every study, every enjoyment, every privation; he was their playmate, as well as their father and mother; he was altogether one with them. In summer-time their schoolroom was rather extensive—wood, and field, and hills were their lecture-halls, their library, their drill-ground, and their museum. On wet days and in winter they practised geometry and industrial subjects by means of a variety of things which they made of paper, pasteboard, or other materials. The 'occupations' of the future Kinder-Garten had here their origin. The plaiting, folding, and cutting out of paper, the building, etc., were practised in a regular, methodical way, and the principles of Pestalozzi received here their first practical and working shape.

Earnest-minded men in any walk of life may be very much admired and praised for their noble services, but after some lapse of time few of them are still remembered. There are many certainly whose memory is held sacred by posterity, whose names are mentioned with pious reverence, and whatever whose hands may have touched is looked upon as a priceless relic, but many of them owe these distinctions to their high station in life, or perhaps to achievements that reflect but little credit on the true dignity of Christian character. Need we adduce another proof of the complete success which attended Fröbel's first independent labours at 'Auf der Oede,' and of the high estimation which he enjoyed, than the touching fact that, up to this very day, the scene of his faithful services, the schoolroom, as well as his own study, are piously kept in the same state as when used by him, and looked upon as a sanctuary of the family? I know of no other instance where the services of a private teacher have been so much valued and honoured.

But however encouraging the many proofs of the complete satisfaction were with which his principals honoured him, Fröbel was far too modest a man to be blinded by them to his own shortcomings. Too stern was the critic to whom he subjected himself to allow of any self-complacency. No, in spite of all that, a most disquieting and most disagreeable truth forced itself upon him. He severely felt the deficiency of his own professional knowledge; what little he had acquired of it had been got in an irregular, unmethodical, fragmentary manner. His success as a teacher often puzzled him, but he was too humble and too modest to ascribe it to the real cause. He did not even know how much of it he owed to his own grand individuality, to his enthusiastic earnestness, to the high principles that animated his soul. Certainly his academical studies had been a mistake. They had been too high for such a feeble foundation, and though they had not been altogether fruitless, their fruits were of a different nature from what is generally expected and acquired at a university. How to make up for deficiencies which, of course, must seriously impair his success as a teacher, he was not long at a loss to discover. He solicited, and readily obtained permission to take his young scholars to Pestalozzi, there to continue his labours, whilst he himself became a pupil again. Surely that was a step in the right direction, and he took it in the summer of 1808. He soon endeared himself to his revered master, entering with heart and soul into his plans, and remained there for two years, a faithful guide to his own pupils, whilst at the same time an earnest-minded and devoted student of Pestalozzi and his work.

It will be needless to say that his keen perception could not fail to discover many defects, such as were but too natural in the first establishment of a system which was still on its trial. He could hardly expect to find there his own high ideal, and yet his overflowing admiration of Pestalozzi caused him to raise his expectations to an excessive height; but if all those minor deficiencies were of little account in the presence of the wonderful grandeur of that remarkable man, with his simple-minded, child-like piety, his touching simplicity, his boundless love of mankind, his restless care of the poor and needy, we cannot but fully agree with him. These were examples of character which could not fail to influence his own enthusiastic nature in the best direction as well as those of his fellow-workers, all of whom were inspired by one grand idea. The constant intercourse with visitors from all parts of the world, many of them of the highest literary or social distinction, and last, not least, the animated discussions, the fiery literary combats, which were unavoidable among men of such energy, such divergent opinions, and such earnest love of grand and everlasting truth, all this contributed greatly to make his stay at Yverdun a lifelong blessing to Fröbel.

But these combats led also to serious dissensions, and made him miss that unity and harmony which was the principal object of his life, and the absence of which in the entire system of Pestalozzi he deeply felt and lamented. Yet his high admiration of all he saw and heard, and his gratitude found a warm expression in a letter to the Princess of Schwarzburg-Rudolstadt, dated April 1st, 1809, which grew to the extent of an essay.* But although his expectations were not fully realised, two important truths were henceforth deeply engraven on his mind, and led him into that channel that should finally land him on his long-desired enchanted island. The one was *the great educational power that might be developed in the playground and in manual occupations*; the other, *the paramount importance of the mother's influence.*

Urged by the restless search after his ideal—the one primary and universal principle in education, a link of the fundamental unity apparent in all the works of God—he left Yverdun in the summer of 1810, resigned his tutorship six months later, and went to Göttingen to resume his long-interrupted academical studies.

(*To be continued.*)

* It is given in full in 'Friedrich Fröbel in seiner Entwicklung als Mensch und Pädagog. First volume, Autobiographie und kleinene Schriften,' page 154, edited by Dr. Wichard Lange. Berlin, Ad. Enslin, 1862.

WHEN THE WIND BLOWS!
A Song for Winter.
T. CRAMPTON.
With spirit.
1st TREBLE.
2nd TREBLE.
BASS.
1. Oh, the dan - cing of the leaves,..... When the wind..... blows! And the
2. Oh, the drift - ing of the snow,..... When the wind..... blows! Show-ing
KEY F. With spirit.
rush - ing noise of trees, Shout - ing, shriek - ing on the leas, Like the sound of seeth - ing
in the cold moon-light Fall - en trees hid un - der white, Like great ghosts in bed at
seas—When the wind..... blows! Oh, the shift - ing of the clouds,..... When the
night—When the wind..... blows! Oh, the com - fort of the fire,..... When the
C. t.
f. F.
wind..... blows! Sail - ing swift - ly on be - tween Skies of blue and earth of
wind..... blows! And to hear the song and chat Of the ket - tle and the
cres.
green, Cast - ing stripes of shade and sheen—When the wind..... blows!
cat, And the crick - et on the mat—When the wind..... blows!
Symph.

Music.

BY RALPH DUNSTAN, MUS. BAC., CANTAB.;
L. MUS., T.C.L.;
Member of the Council of the Tonic Sol-fa College, etc.

(Continued from page 498.)

WE have now investigated no less than *fifteen* major scales, all of which are identical in construction, containing the same intervals in an invariable order. Sharps and flats are necessary in order to represent the 'common scale' at various pitches, and this is their chief use.

IN THE TONIC SOL-FA NOTATION the major scale, at whatever pitch, is always represented by the letters

d	r	m	f	s	l	t	d'
(Doh)	(Ray)	(Me)	(Fah)	(Soh)	(Lah)	(Te)	(Doh)

the *key-note* being written at the beginning of the piece of music to show at what pitch the scale is taken.

Thus :—

is represented by

KEY C. d r m f s l t d'

and

by

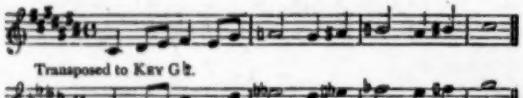
KEY E. d r m f s l t d'

and

by

KEY D♭. d r m f s l t d'

DOH represents the *tonic* or *key-note* of the scale, and the semitones fall between ME and FAH, and between TE and DOH. *Transposition*, or writing a piece of music in a higher or lower key than that originally employed, is thus exceedingly easy in Sol-fa, the only change necessary being the simple alteration of the key-name at the beginning. Thus, the transposition of a piece of music from the key of C sharp to the key of G flat, a somewhat difficult process in the Staff Notation, would be effected by writing 'Key G flat' at the beginning instead of 'Key C sharp.' Study carefully this process as shown below in both notations.



Transposed to KEY G♭.

In Sol-fa Notation this would be shown thus :—

KEY C♯.

d	:r.m	f	:m.s	la: —	s	:l	ta: —	l	:t	d'	:—	—	:—

KEY G♭.

d	:r.m	f	:m.s	la: —	s	:l	ta: —	l	:t	d'	:—	—	:—

Before proceeding further it is necessary to show how 'sharps' and 'flats' are indicated in Sol-fa Notation.

The *sharp* of any note is shown by writing the vowel 'e' after the letter representing it. Thus d represents doh, and *de* represents the sharp of doh; *re*, the sharp of ray, etc.

The *flat* of a note is shown by the vowel 'a'; thus *ta*, flat of te; *la*, flat of lah, etc.

The sharp or flat of a note is a 'chromatic' semitone higher or lower than the note itself.

TABLE OF SOL-FA CHROMATICS.

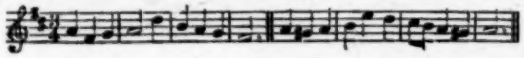
de is d sharp		ra is r flat	
re	„ r „	ma	„ m „
fe	„ f „	sa	„ s „
se	„ s „	la	„ l „
le	„ l „	ta	„ t „

The exceptional and very rarely used sharps of m and t are *my* and *ty*, respectively; and the exceptional flats of de and f are *duh* and *fuh*.

In Sol-fa language we never speak of *soh sharp*, *me flat*, etc., but call the notes by their inflected names se, ma, etc.

NOTE.—ra, ma, sa, la, ta, are pronounced *raw*, *maw*, *saw*, *law*, *taw*.

TRANSITION, OR CHANGE OF KEY.—When we alter the key-signature of a piece of music we 'transpose' it. This is, however, very different from those changes of key which occur during the course of a musical composition, and which we call 'transitions.'



In the second section of this example, the presence of G *sharp* instead of the G *natural* required for the key of D, shows that a change or 'transition' has been made to the key of A. You will remember that the addition of G sharp was the only change required to effect this (see p. 427).

Written in Sol-fa, the above example would appear thus :—

KEY D.

s	:m	:f	s	:—	:d'	l	:s	:f	m	:—	:—
s	·fe	:s	l	:r'	:d'	t.l	:s	:fe	s	:—	:—

Here fe takes the place of G sharp, and indicates the transition; but since the second section is really in key A, and the *tonic* or *key-note* is always represented by d, it is evident that this section *ought* to be written thus :—

KEY A.

d	:t,	:d	r	:s	:f	m.r	:d	:t,	d	:—	:—

and the whole piece should be represented thus :—

KEY D.

s	:m	:f	s	:—	:d'	l	:s	:f	m	:—	:—

KEY A.

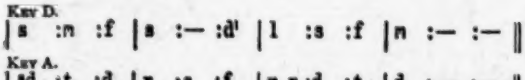
d	:t,	:d	r	:s	:f	m.r	:d	:t,	d	:—	:—

You will notice that the d of key A is a *perfect fifth* higher than the d of key D, and since the singer would have to change the pitch of his d in order to sing the piece correctly, it is advisable to give him some help in the shape of what is called a 'Bridge-tone,' or tone for passing over from one key into another.

Referring again to the Staff Notation example above you will see that the note A is the *soh* of key D, and the *doh* of key A. Taking advantage of this *double* or *two-fold* relation, we give as our 'bridge-tone' some note as near the change of key as possible, with its *old* name in small type, and its *new* name in the ordinary

type, thus—ˢd. In singing this, the sound *soh* is taken from the original key. This sound is at once called *doh*, and the singer being provided with his new key-note launches out easily and boldly into his new key.

Showing change of key and bridge-tone, the piece is written in this way :—



It is, therefore, possible to represent transition either by means of 'chromatics' or by changing the 'd.' The former method is called the 'IMPROPER METHOD,' but is convenient for short transitions (or those which extend over a few notes only); the latter, or 'BETTER METHOD,' should be used for transitions which are *extended* in length.

We shall have much more to say about 'Transition' in a subsequent chapter; meanwhile, the student will gain a clearer knowledge of the subject by studying the following examples, and by writing out others which he may find in any hymn-tune book, than by a volume of remarks.

Notice here the use of chromatic notes: it requires some experience and a knowledge of harmony to be able to say with certainty when the key is changed, and when chromatics are employed for a different purpose.

MENTAL EFFECTS.—Each note of the scale, when sung slowly, has a certain effect upon the emotions different from that of every other note. This is called its 'Mental Effect,' and it is very difficult, perhaps impossible, to describe *in words* what this effect is. Mr. Curwen, in his excellent manual of 'Musical Theory,' Bk. I., page 19, gives what he calls 'the *proximate* effect of the tones when sung in a slow melody.' These are embodied in the table below, and the technical name of each note is also given, these technical names being employed by *all* musicians for the successive notes of any major scale.

The student should sing the notes of the scale slowly and firmly, and try to *realise* the mental effect of each: this will serve as a test of his 'musical perception.'

Technical Name.	Solfa Name.	Mental Effect.
Tonic	DOH¹	The STRONG, or *Firm* tone.
Leading-Note (or Sub-Tonic)	TE	The PIERCING, or *Sensitive* tone.
Sub-Mediant (or Super-Dominant)	LAH	The SAD, or *Weeping* tone.
Dominant	SOH	The GRAND, or *Bright* tone.
Sub-Dominant	FAH	The DESOLATE, or *Awe-inspiring* tone.
Mediant	ME	The STEADY, or *Calm* tone.
Super-Tonic	RAY	The ROUSING, or *Hopeful* tone.
Tonic	DOH	The STRONG, or *Firm* tone.

Doh, Me, and Soh are called the *Strong* tones, and Ray, Fah, Lah, and Te the *Leaning* tones. Te *leans* strongly 'upwards' towards Doh, and Fah *leans* strongly 'downwards' towards Me: hence Te and Fah are said to have the 'most marked leaning tendency.'

COMPOUND TIMES.—In addition to *two*-pulse, *three*-pulse, and *four*-pulse measures, the most common are *six*-pulse measure and *nine*-pulse measure; and occasionally *twelve*-pulse measure.

SIX-PULSE MEASURE.—This is a *Compound* Time, *one* six-pulse measure being made up of *two* three-pulse measures :—

| : : | : : |
| STRONG, *weak*, *weak*, | Medium, *weak*, *weak*. |

The *Primary* Form commences with the STRONG accent, and the student will perceive that there may be *five* 'other' forms, which, in order of frequency of use, are as follows :—

Second Form : *weak* | : : | : : | STRONG, *weak*, *weak*, Medium, *weak*, } etc.

Third Form : | : : | : : | *weak*, Medium, *weak*, *weak*, STRONG *weak*, } etc.

Fourth Form | : : | : : | : : | Medium, *weak*, *weak*, STRONG, *weak*, *weak*, } etc.

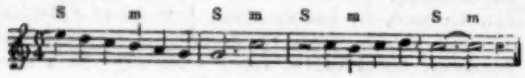
Fifth Form : : | : : | : : | *weak*, *weak*, STRONG, *weak*, *weak*, Medium, } etc.

Sixth Form : : | : : | : : | *weak*, *weak*, Medium, *weak*, *weak*, STRONG, } etc.

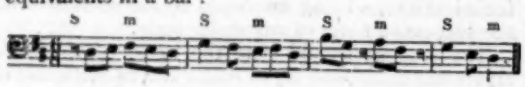
The Fifth and Sixth forms are rarely used in Vocal Music.

This may be called a COMPOUND DUPLE TIME, containing *two* primary accents in each measure; it is represented in the Staff Notation by $\frac{6}{4}$, $\frac{6}{8}$, and $\frac{6}{16}$ Times.

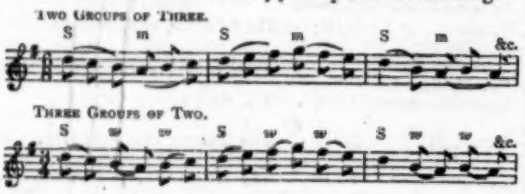
$\frac{6}{4}$ (six-four) Time, containing six *crotchets* or their equivalents in a bar:



$\frac{6}{8}$ (six-eight) Time, containing six *quavers* or their equivalents in a bar:



N.B.—$\frac{3}{4}$ Time also contains *six* quavers in a bar, but the accents fall differently; compare the following:—



There is the same distinction between $\frac{6}{4}$ and $\frac{3}{2}$, and between $\frac{6}{16}$ and $\frac{3}{8}$.

$\frac{6}{16}$ (six-sixteen) Time, containing six *semiquavers* or their equivalents in a bar:—

NINE-PULSE MEASURE, OR COMPOUND TRIPLE TIME.—*One* nine-pulse measure contains *three* three-pulse measures, with the variety of *two medium* accents. The four most common forms of this measure are:—

Primary Form:—

| : : | : : : | : : : ‖
| STR., *weak*, *weak*, Medium, *weak*, *weak*, Medium, *weak*, *weak*, ‖ etc.

Second Form:—

: | : : | : : | : :
weak, | STRNG., *weak*, *weak*, Medium, *weak*, *weak*, Medium, *weak*, *weak*, etc.

Third Form:—

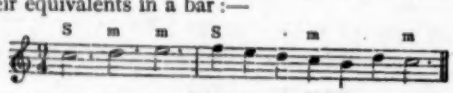
| : : | : : | : :
Medium, *weak*, *weak*, | STRNG., *weak*, *weak*, Medium, *weak*, *weak*, etc.

Fourth Form:—

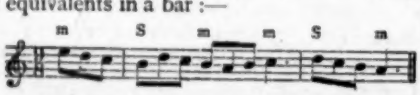
: | : : | : : | : :
weak, Medium, *weak*, *weak*, | STRNG., *weak*, *weak*, Medium, *weak*, etc.

In Staff Notation, Compound Triple Time is represented by $\frac{9}{4}$, $\frac{9}{8}$, or $\frac{9}{16}$.

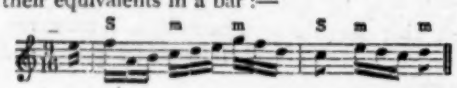
$\frac{9}{4}$ (nine-four) Time, containing nine *crotchets* or their equivalents in a bar:—



$\frac{9}{8}$ (nine-eight) Time, containing nine *quavers* or their equivalents in a bar:—



$\frac{9}{16}$ (nine-sixteen) Time, containing nine *semiquavers* or their equivalents in a bar:—



COMPOUND QUADRUPLE TIME is generally indicated by the figures $\frac{12}{8}$, though $\frac{12}{4}$ and $\frac{12}{16}$ are sometimes used.

$\frac{12}{8}$ (twelve-eight) Time, containing twelve quavers (*four* groups of *three*) or their equivalents in a bar:—

This Time is not often shown in Sol-fa as an actual *twelve*-pulse Measure, but (generally) as a four-pulse Measure, with each pulse divided into a 'triplet'; or, in other words, as a 'Tripletted Four-pulse Measure,' thus:—

KEY F.
| d ,r ,m :s ,f ,m |l ,t ,d' :t &c. ‖

(To be continued.)

—o—

How I Examine in English.

PAPER I.—REPETITION.

THE English of Standard I. is not by any means easy to select. For it is advisable, wherever possible, to choose a poem of about twenty lines, quite complete in itself, expressed in simple language, and suited to the taste of children of the lower class, between seven and eight years of age.

Now I do not think that a better poem for the purpose could be chosen than William Blake's 'Chimney Sweeper,' which, for the benefit of those who are unacquainted with it, I here subjoin:—

THE CHIMNEY SWEEPER.

When my mother died I was very young,
And my father sold me while yet my tongue
Could scarcely cry—'Weep! 'weep! 'weep! 'weep!
So your chimneys I sweep, and in soot I sleep.

There's little Tom Dacre, who cried when his head
That curl'd like a lamb's back was shaved: so I said,
'Hush, Tom; never mind it; for when your head's bare
You know that the soot cannot spoil your white hair.'

And so he was quiet, and that very night,
As Tom was a-sleeping, he had such a sight,
That thousands of sweepers, Dick, Joe, Ned, and Jack,
Were all of them lock'd up in coffins of black.

And by came an angel who had a bright key,
And he opened the coffins and set them all free;
Then down a green plain, leaping, laughing, they run,
And wash in a river, and shine in the sun.

Then naked and white, all their bags left behind,
They rise upon clouds and sport in the wind;
And the angel told Tom if he'd be a good boy,
He'd have God for his Father, and never want joy.

And so Tom awoke; and we rose in the dark,
And got with our bags and our brushes to work;
Though the morning was cold Tom was happy and warm;
So, if all do their duty, they need not fear harm.

Before proceeding to say how I should examine upon this poem, let me make a few suggestions as to how it should be taught.

First of all the pathetic story of Tom Dacre should be *told* to the children in very simple words. The children should be then taught to read the poem in which their interest has thus been excited. This will be a matter of little difficulty to a good 1st Standard, more particularly if that poem is not presented to them until twenty-three weeks before the examination.

For not only will the children be better qualified by that time to *read* the poem well, but they will be less likely to fall into the gabbling style of repetition which I find so common in the case of 1st Standards who have been drumming away at their twenty lines of English for the whole year long.

It will be a safer policy still for 1st Standard children to learn three or four short pieces in the year, than to give the whole of it to a single piece, for if the recitations be properly taught the children will undoubtedly improve as they go on, and the repetition of the second or third piece may have qualified the children to earn the mark 'Good' or 'Excellent,' whereas their rendering of the first piece would have only earned them the mark 'Fair.'

I certainly have noticed that just as actors get to play a piece much more tamely after it has had a 'long run,' so school children absolutely fall off in a piece which they have repeated for a long time, and no doubt, as in the parallel case, because they have ceased to take an interest in what they are saying.

Next, I have to guard teachers against the common practice of what may be best described as the 'chanting' of their pieces by school children. This style of recitation arises from the habit that teachers fall into of getting children to say their poem simultaneously, at any rate at the beginning of the year, *without setting them a good model of recitation.*

Before teaching children how to repeat a poem like the one above cited, it should be carefully studied by the teacher. Such study will enable him to note what points should be brought out in the recitation, and communicate them to his subordinate teachers as well as to the children. Assistant and Pupil Teachers entrusted with the preparation of classes in recitation should certainly not only study the poem under their teachers, but commit it to memory. By so doing they will have a much greater command over their class.

For the scholars will appreciate the fact that their teacher has taken the trouble to learn the piece by heart along with them, and a much greater finish, as well as ease of instruction, will belong to that teacher who can lay down the book and throw himself entirely into the attitude of a speaker or narrator. But if, on the other hand, the scholars are left pretty much to their own devices, and nothing is expected from them by their teacher beyond the correct repetition of the words, without any light or shade of expression, faults of the following kind will be sure to prevail.

1. The undue accentuation of the last word in each line, especially in the case of consecutive rhymes.

2. As a consequence of the above fault, an undue pause at the end of the line when there is no stop to give occasion to it.

3. A curious tendency arising out of the chanting of the poem by the whole class to accent certain syllables in each line, without any regard to the sense, but entirely from the necessity of having rallying points in the cadences, into which ill-taught, simultaneous recitation will resolve itself.

4. A tendency to take breath at wrong places in the poem, arising out of this method of chanting the lines.

5. A too slavish adherence to the metre of the poem without regard to its sense. This fault specially shows itself in the common fashion into which children fall of saying the poem line by line, and verse by verse, precisely at the same rate, just as a public-school boy would do if he were asked to scan his Virgil or Horace.

After these warnings let us return to 'The Chimney Sweeper.'

The first two lines of the first verse, and indeed the whole of this verse, should be said slowly and sadly, as if in answer to a previous question.

Care should be taken not to pause at the end of the second line, and the words ''Weep, 'weep, 'weep, 'weep,' might very well be uttered in imitation of the street cry. There should be a distinct pause at the end of the third line in order to emphasize the consequence contained in the fourth.

In the second verse the story of little Tom Dacre should be introduced quite as a familiar instance of chimney life, the two last lines being given in a natural conversational manner.

A difficulty in the measure of the first two lines will be got over by dwelling emphatically upon the word 'cried,' gaining breath in the sigh which should succeed it, and accenting the word 'lamb's.'

The next three verses are a narrative which should be told with eager, child-wonder, the last should be given with an air of cheerful content.

In examining a class of from fifteen to five-and-twenty children I have been in the habit of expecting each child, in whatever standard, to repeat a verse of the poem committed to memory.

When the class is a large one I have heard every alternate child recite. But then, when the recitation is over, I have addressed questions bearing upon the context and general drift of the poem, in the first of the instances adduced to the whole class, in the second to those scholars who have not repeated any of the poem, calling in each instance for a show of hands, and then selecting the answer from those children whose hands are held up.

I have little to add to what I have already said about my method of examining Standard I. in recitation when I come to the other standards.

In Griffith and Farran's 'Poetry for the Young' well graduated in a series entitled 'Poetry for the Standards,' and again in such books as Macmillan's 'Children's Treasury of English Song,' thoroughly good, choice pieces, suitable for this and the succeeding Standards, will be met with. Mrs. Hemans's 'Casabianca,' which is to be found in all collections, Mr. William Allingham's 'The Fairies,' page 89 of the 'Children's Treasury,' and Wordsworth's 'We are Seven,' are well within the capacity of the 2nd Standard.

The 3rd Standard will enjoy Wordsworth's 'Lucy Gray,' or, in a different vein, D. Mallet's 'William and Margaret,' or, again, Wordsworth's 'Alice Fell.'

Owing to the length of its lines, few inspectors would refuse to accept Lord Macaulay's 'Spanish Armada' for Standard IV. Again, two very good martial pieces which together would meet the requirements of this standard are Thos. Campbell's 'Hohenlinden' and Sir Walter Scott's 'Last Charge of the French at Waterloo.' Sir Walter's 'Shepherd in Winter' and 'Young Lochinvar' make another good pair of pieces for Standard IV., and Longfellow's 'Wreck of the Hesperus' is also a very suitable poem for this standard.

Standards V. and VI. will do well to make up their lines from a play of Shakspeare which they have in the first instance read through, either in whole or part, —fifteen hundred lines of Shakspeare now sufficing as a reader for these standards. With regard to the *kind*

of questions I put to the standards above the first, I may say that they are generally directed towards ascertaining how far the children appreciate the purpose of the poem. I also ask them the meanings of those words that I know do not belong to their ordinary vocabulary.

When the verses learnt take the form of dialogue, I direct the scholars to face one another in pairs throughout the class, and to look into one another's eyes as they speak their parts to one another.

It is remarkable to what a degree sing-song ceases in recitation when the children have thus been accustomed to say their pieces at one another, and what intelligence is communicated to the reading of the rest of the play if it be taken up as a class reader.

On this ground alone I strongly urge teachers to make 1,500 lines or thereabouts of Shakspeare serve the purpose of a reading-book.

A paper on 'How I examine in Grammar,' to follow.

—o—

Education in Queensland.

THE education report makes its appearance at an unusually late period of the year. It is the seventh of the series since the department was organised under the Minister for Public Instruction, and it partakes of the usual stereotyped form. It matters not who may be the Minister—whether Mr. Griffith, or Mr. Palmer, or Mr. Archer, the report is the same—a rigid official statement of facts and figures, with scarcely a trace of any variety in sentiment or expression. When the present system was adopted, its governing principles were subjected to full discussion, and they were deliberately adopted with a full knowledge and appreciation of their bearing. The results of this system are annually detailed in the report of the department, and so far they must be regarded as satisfactory. If there are defects they are not very glaring ones, and even if everything is not accomplished that might be, still much is being done, and the machine is working steadily on with a fair amount of exactness. Last year, we are told in the opening paragraph that 'there was no feature in the administration requiring special remark.' Year after year the spindles are at work. The spinning and the weaving are pursued with praiseworthy industry. Warp and woof are at work, and the master manufacturers are satisfied with the result, no finer or more substantial texture being possible. This is of course very satisfactory to know. Gradually the amount of material turned out increases. The expenditure, all things considered, is not extravagant, and as the rising generation grows up to maturity it may fairly be anticipated that we shall not be ashamed of our handiwork.

And yet it does seem as if we might do a little more. Seven years ago, when the Act first came into operation, the mean quarterly enrolment was 27,228, and the daily average attendance was 18,245. Last year the mean quarterly enrolment was 31,778, and the daily average attendance 21,610. Meanwhile, however, the non-vested schools have disappeared from our tabulated lists, and thus to some extent we account for the fact that in 1882 the daily average attendance stood at 23,818, the highest figures yet reached. The expenditure on salaries and allowances for primary schools has grown from £62,655, in 1876, to £86,891, in 1883, and in the meantime a sum of fully £100,000 had been expended on buildings. No exception, indeed, can be taken to this expenditure, considering that everything had to be found—buildings, teaching material, not to say teachers. If it had cost twice as much we should be disposed to think that it would have been capital well expended, especially if we have regard to some other items which figure so largely in our ledger columns of expenditure. Still it must be confessed that the annual expenditure has increased in a ratio which is disproportioned to the attendance. Is a daily average attendance of 21,610 at our State schools an entirely satisfactory result? It may, we think, be fairly doubted. It is known, of course, that there are other schools—denominational and private—which do not come directly under the detailed observation of the Minister. But in order to arrive at any fair conception of what the Department of Public Instruction is really doing, we ought, in the first place, to know how many children there are who are of school age. Are there 50,000 or 60,000? What schools do they attend, and what is the character of the teaching? What, indeed, are the actual results of the available teaching power? Without knowing this we are still a good deal in the dark about what is going on. We are told, for instance, that the denominational schools still in existence are inspected and reported on, though no mention of them is made further than this. It seems in itself to be very reasonable that they should be inspected, but if inspected, why should we hear nothing of the work they are doing, and the number of children thus taught? Or, to go a step further, why should we not be told of the private schools in operation which are not inspected? It would not be in the least difficult to enumerate them. We should then get at the sum total required to enable us to arrive at a just conception of the actual position. This might involve a little more work for the inspectors, and they already complain that they cannot overtake their work properly. But even if it were necessary to increase the staff in order that this most essential portion of the system should be carried out effectually, Parliament, we feel convinced, would offer no objection to the necessary expenditure, even if it amounted to an additional £1000 a year.

It is needless to say that the efficiency of such a system as that now in force must depend on the teachers. Do we get the best we can, and are they adequately paid? There is some conflict of evidence as to this. The Minister, in his report, says that 'no difficulty was experienced in maintaining throughout the year school staffs of full strength.' This is encouraging, but he qualifies it by adding: 'There are symptoms that the commercial prosperity of the colony is likely to lessen the number of boys and young men offering for employment as teachers.' Mr. Ewart, the General Inspector, more than confirms this very guarded statement. He says distinctly that there is a difficulty in obtaining a proper supply of qualified male teachers. The consequence is, as he points out, that an undesirable number of female teachers are being appointed. In order to meet this difficulty, Mr. Ewart hints, for it hardly amounts to a suggestion, that we could obtain a supply from Victoria. Applications have been received by the department from teachers in the other colonies, and especially in Victoria. These applications, however, are not entertained unless the applicant presents himself at the department in order that his qualifications may be tested. The General Inspector seems to think that this difficulty might be got over by appointing some competent person to satisfy himself on this point. A schoolmaster in Victoria will not, in all probability, give up a situation there for the chance of one in Queensland; but, on the other hand, if he can be secured employment after inquiry, his reluctance to break up his home would be correspondingly diminished. It seems that a supply of vigorous trained teachers, fit for their position as head masters, is a desideratum at the present time, and Mr. Ewart thinks that they could be obtained by a system of judicious recruiting. Possibly the General Inspector would undertake this mission himself. It is one which would have to be handled rather discreetly, for the Education Departments in the neighbouring colonies would naturally not be very desirous to supply us with some of their best men; and yet we should scarcely be content to take any but experienced competent men. If, however, there are really good teachers in Victoria or elsewhere who think that they will have better prospects

here, there ought to be no difficulty in ascertaining their qualifications before entering into any engagement with them. The Agent-General is authorised to recruit teachers in 'the British Islands,' according to the phraseology of his report. Last year, however, he only obtained four—three males and one female—the demand for teachers in 'the British Islands' being just now quite on a par with the demand in Australia, and the inducements for high-classed teachers being rather better than they are here. Why, then, should we not turn our attention to some other source of supply?

There is another feature of the present system which deserves some notice just now. It is that which refers to the establishment of provisional schools. Now these, when they really are provisional and tentative, serve admirably to pave the way for State schools. They bear a large proportion to the whole number of schools in operation. There are 135 of these, with an enrolment of 4,540, and an average daily attendance of 2,495. When, however, the attendance at these schools is analysed it is seen that, while at some the daily average falls down to 8, 9, and even 7, there are others again where the daily attendance rises to 60, 40, 30, and so on. There are provisional schools, for instance, at Burrum, with 72 children; Cootharaba with 80; Herberton with 149; Hodgson with 48; Isis with 43; Lake's Creek with 45, and so on. These places should surely be supplied with good State schools. They have certainly passed the provisional stage.

Then again, the attendance at them is a most variable quantity. Burrum, with its 72 children, has a daily average attendance of 27. Herberton, with 149, has a daily average of 61. Georgetown, with 47, has a daily average of 16. These cases, and many others, are quite inexcusable. Contrast them with such schools as Ellangowan, where there are 18 children on the roll, and a daily average of 18; or of Rosenthal, with 30 children on the roll, and a daily average of 24; or of Charleville, with 47 and 38 in daily attendance, and many others, where the attendance is as high as 70 and 80 per cent. At the other extreme there are schools—such as those at Gayndah, Baltinglass, Alfred, North Bundaberg, and so on—where the attendance does not reach 40 per cent. As long as these inequalities exist it must be admitted that we have not yet approached to perfection. If, in the cases of regular attendance referred to, a creditable average was reached, there can be no justification for irregularity in the other cases. The latter indicate radical defects which ought to be remedied, and no time should be lost in working out a remedy. We may talk about the influence of public opinion. Something more than public opinion is required to save thousands of children from growing up in disgraceful ignorance and lawlessness. 'Order,' as the saying is, 'is Heaven's first law;' and without regular attendance there can be no real order, no assured progress, in our primary schools.—*Brisbane Courier*, Sept. 12th, 1883.

Science Notes.

FIRE-PROOF PAPER.—It is said that M. G. Meyers, of Paris, has recently invented a species of paper which, in addition to being uninflammable at a considerable heat, also preserves its ordinary appearance though exposed to the action of fire. It is hardly necessary to point out the immense value of such a discovery to theatrical managers, etc., when we reflect how many of the deplorable fires of our great cities are caused by the ignition of such combustible material as theatrical scenery.

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ELECTRIC RAILWAY.—An electric railway from Portrush to the Giant's Causeway was opened by Earl Spencer lately, in the presence, among others, of Sir William Siemens and Sir William Thompson. Power was obtained from a waterfall twenty-four feet high in the River Rush, the whole of which was utilised by the agency of turbine waterwheels; the power obtained was computed to be equal to ninety horses.

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UNIVERSITY COLLEGE, NOTTINGHAM.—A very important and hopeful departure has been taken by the authorities of the above college. It has been decided to form technical classes for instruction in engineering and sciences connected therewith, and also to provide opportunity for artisans to make themselves acquainted with the machinery used in the manufactures in which they are employed. During the current term there will be day classes or lectures for such sons of manufacturers and others as, intending to prosecute a manufacturing profession, desire to make themselves familiar with the construction of machinery. Every appliance of modern science and convenience of modern education will be at their disposal. In the evening classes will be held at which engineers' apprentices, and others, will have a chance of preparing to compete for the Whitworth scholarships, and of gaining a fuller and more rapid acquaintance with the details and principles of their profession. A mechanical museum will be open to all the students, in which will be exhibited models of all the mechanical movements which are generally recognised, with appended explanations of their special features and application to lace and hosiery machinery. There will be also working models of lace and hosiery machines, with moving parts labelled so as to more fully explain the other models referred to. Professor Garnett, late fellow and lecturer of St. John's College, Cambridge, and author of the well-known treatise on Dynamics, will have the general superintendence of the workshops.

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THE CRYSTAL PALACE EXHIBITION.—The directors have arranged for an International Exhibition of Arts, Manufactures, Science, and Industry, to be held from April to October, 1884. Mr. G. C. Levey has been intrusted with all the details.

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LIQUEFACTION OF GASES.—Wroblewski and Olszewski (*Compt. Rend.* xcvi., 1,140 and 1,225) give the following results of their experiments on the liquefaction of gases. At minus 136° oxygen liquefies under a pressure of 22½ atmospheres; nitrogen at the same temperature and as great a pressure as 150 atmospheres will not liquefy, but on gradually diminishing the pressure and keeping it at the same time above that of 50 atmospheres the gas will liquefy. Carbon disulphide solidifies at minus 116°, and alcohol at minus 130°·5.

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A CHEMIST ON CHOLERA.—M. Ramon de Luna states that from his chemical and physiological studies in Madrid and the Philippines, he is convinced that cholera is exclusively propagated through the respiratory organs, and that the proper treatment is the inhalation of hypoazotic vapour mixed with air; also that the best prophylactic is found in hypoazotic fumigations of rooms, utensils, etc., twice a day. In support of his theory he alleges that during the cholera plague at Manilla, in 1882, three hundred artisans employed in the mint were successfully treated in this manner.

SUBMARINE TUNNELS.—Now that the Channel Tunnel scheme is for the present knocked on the head, we hear that the scheme for connecting the Isle of Wight and the mainland by a similar plan is revived, and that the machinery employed in the Channel Tunnel works will be available for the undertaking. This would be a measure to which no exception could be taken on political grounds, and if successful might be made the means of scientific experiments as to the supposed difficulties of defending the larger tunnel.

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INFECTIOUS DISEASES AND MILK.—The terrible epidemic of typhoid fever which has been raging in the parish of St. Pancras, London, has been almost conclusively traced in its origin to the use of milk procured from a dairy in which the water used for cleansing the pails, etc., was drawn from a well tainted by a neighbouring cesspool. This has given rise to the suspicion that other epidemics may originate in the same way, and at the meeting last month of the Social Science Congress, special attention was directed to the subject by the Health Department. Dr. Britton and Messrs. Vacher and Ernest Hart all urged the desirability of additional measures for preventing the spread of disease through this agency. Their arguments resulted in the adoption of the following resolution:—'That, in view of the large amount of disease reported to this section as due to the spread of zymotic illness through the milk supply—amounting to eighty-two recent epidemics affecting upwards of 5,000 persons—the Council of the Social Science Association is requested to take into consideration the advisability of recommending to the Government the adoption of further measures to prevent the spread of zymotic disease through this channel by transferring the duty of the regulation of dairies and dairy-farms from the Privy Council to the Local Government Board, and from the veterinary to the sanitary authorities; and further, by the issue of by-laws for the licensing of milk-sellers, and the regulation of the water supply, premises, and drainage of dairies and dairy-farms, and the compulsory notification of cases of infectious disease in dairies and dairy-farms.' It is to be hoped that so important a question may receive the early attention of the Legislature.

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CONGO EXPLORATION.—The latest news from Mr. H. M. Stanley tells of his discovery of a new lake—Mantumba—and his exploration of the so-called River Ikelembu, a stream really named the Malundu, which he finds to be deep, broad, and navigable. The population in the basin of the Congo he estimates at somewhere about forty-nine millions, a number which he regards as surprisingly large, while he adds that extensive commercial openings are offering themselves.

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ELECTRIC TRAMCAR.—Electricity has been tried in Paris recently to light and propel a tramcar along the Quai de la Conférence. It was stored in Faure accumulators, weighing together two and a half tons, and placed under the seats. A speed of eleven miles an hour was attained—a striking contrast to the miserably slow rate of our own horse-cars; but it seems doubtful whether the expense will not be found to be too great for the general adoption of the invention.

SCIENCE AT CAMBRIDGE.—News of very different nature and interest in the science world is to hand from our sister Universities. At St. John's College, Cambridge, the great progress of scientific teaching and investigation has been acknowledged by the election of science students to two out of three Fellowships awarded. A still more hopeful indication for the future is to be found in the announcement that in subsequent Fellowship examinations, competitors will be allowed to submit to the electors any independent work they may have completed, and this will be taken into consideration in assigning the Fellowships. Trinity College has already announced its willingness to award a Science Fellowship every year, provided a candidate of sufficient merit present himself, so that on the whole science prospects at Cambridge are brightening considerably.

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SCIENCE AT OXFORD.—From Oxford a less encouraging report has been spread of late. The old sentimental and ignorant outcry against scientific experiments on living animals under any conditions whatever has been revived, and despite the fact that such experiments are absolutely necessary for the due prosecution of scientific research, and in spite of the stringent limitations already and rightly imposed, a certain not insignificant school of graduates is endeavouring to quash such experiments in the new laboratories.

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MEMORIAL COMPETITION PRIZE.—In memory of the late Mr. Wm. Newmarch, F.R.S., the Council of the Statistical Society announce the institution, through the generosity of Mr. H. D. Pochin, of a prize of £100 for an essay on 'The Extent to which Recent Legislation is in Accordance with or Deviates from the True Principles of Economic Science, and Showing the Permanent Effects which may be expected to arise from such Legislation.' Essays for this competition (which is perfectly open, we believe) must be sent in on or before May 1st, 1884.

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METEOR IN SWEDEN.—A magnificent meteor is reported from Hernösand, Sweden, as having been seen on the 26th of October, about 7 p.m. It is described as suddenly lighting up the darkness, and flashing across the sky with a blinding white lustre. The observer adds that when halfway between the zenith and the horizon it seemed to burst suddenly, throwing out sparks in every direction.

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THE LATE PROFESSOR P. T. RIESS.—The death is announced of Professor Peter T. Riess, author of the well-known work on frictional electricity, *Die Lehre von Reibungselektricität.* He was the first Jew admitted into the Prussian Academy of Sciences, and distinguished himself by his researches on ring-figures produced by discharges, on the electric air thermometer, and on the phenomena of the return stroke.

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ARSENIC IN WINES.—A remarkable affair is reported from Nimes. Complaints having been made to a vineyard proprietor about his wines, he submitted them for analysis. The result was the discovery of an excessive proportion of arsenic. It appears that the barrels used for the wine had been cleaned with

'drogue,' a sort of diluted sulphuric acid. Now the sulphuric acid of central France has of late years contained a considerable amount of arsenic, the presence of which in the wines is thus explained.

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INCANDESCENT LAMPS. — Professor Reluy, of the Vienna Ecole Polytechnique, has demonstrated lately that incandescent lamps, fed by alternating currents, are preferable to those fed by direct currents. In the latter case, it appears that carbon is transferred to the negative side of the filament, the top of which increases in size if the direction is changed at regular and comparatively long intervals, while with the indirect currents the filament preserves its form for a very long time though it slowly becomes thinner at the bend.

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IN this connection it is interesting to learn from the *Electrician* that incandescent electric lamps were used forty years ago in a mine. Carbon in a vacuum —though not so perfect a one as can now be obtained —was used with satisfactory results. It is curious to find that the discoveries of recent years have thus, to a certain extent, been anticipated by other unknown experimenters.

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MINES OF VICTORIA.—From the 'Mineral Statistics of Victoria' for 1882, published by the Minister of Mines, we learn that during 1882 the quantity of gold obtained from alluvial deposits was only 352,078 ozs., the amount having gradually declined since 1868, when it was as high as 1,087,502 ozs. By quartz mining in 1882, 512,532 ozs. were obtained; tin mining has produced metal to the value of £355,498, copper of £100,915, and antimony of £167,247.

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BIOLOGICAL AND ZOOLOGICAL STATION IN SCOTLAND.—For some time past the advisability of founding a biological and zoological station at Edinburgh has been discussed, and we are happy to say the question has now taken a practical aspect. The old Granton Quarry has been hired for fifteen years, and the works are already commenced. The station committee announces as the object of the work, 'A scientific exploration and description of the Firth of Forth, and the adjacent parts of the North Sea; and the establishment of a marine station for biological investigation and research.' The institution, it is hoped, will be able to commence operations by April next, the necessary funds being derived from the surplus from the late Fisheries Exhibition in Edinburgh, and private donations.

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MEDICAL DEGREES FOR WOMEN AT BOMBAY.—We hear that the Syndicate of the Bombay University has recommended the Senate to admit female students to their medical degrees on the same terms as men, and that should the Senate consent to this innovation a portion of the Bombay Fund for the Provision of Medical Women for India will be devoted to the foundation of five scholarships for female students at the Grant Medical College.

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BEN NEVIS OBSERVATORY.—The observatory lately in course of construction on Ben Nevis has been fully completed. Mr. R. T. Ormond, an Edinburgh student, and an original worker in the physical laboratory of that University, has been appointed superintendent, and under his direction meteorological observations will henceforth be made.

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ELEPHANTS' MILK.—It is stated by Dr. Quesneville that elephant's milk resembles cream, though it has not its consistency. When seen in the microscope the globules are large, transparent, and sharply outlined. The cream rises rapidly, leaving the milk of a bluish tinge. The fatty matter has a yellow colour, similar to that of olive oil; it solidifies at four degrees below zero, Fahrenheit. The odour and taste are very pleasant. The reporter of *Les Mondes* looks forward to the day when some bold speculator will milk elephants in the streets of Paris, in order to offer glasses of the milk to amateurs, and predicts a brilliant success to the first one who will try the experiment.

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ADULTERATION OF FOOD.—The misdirected ingenuity of man is well illustrated in the reports of the municipal laboratory of Paris on the subject of food adulteration. For example, gooseberry jelly is manufactured from seaweed, the colour being obtained from fuchsine and the flavour from the following compound, in which, be it noted, there is not a drop of gooseberry juice, viz., 5 parts acetic ether, 4 parts tartaric acid, 1 part benzoic acid, 1 part succinic acid, 1 part aldehyde and ænantic acid. M. Girard, the Director of the laboratory, also gives the composition of other chemical compounds for imitating the flavours of strawberry, pineapple, melon, apple, pear, cherry, peach, apricot, and plum. Flour being exposed to damp to increase its weight, the gluten is rendered less fit for breadmaking, and the bread is more liable to mould. The worst adulteration is that of flour by mineral products, which are often poisonous, *e.g.*, lead, copper, zinc, sulphate of lime, and chalk. Flour has been imported into France from Rotterdam containing as much as 20 per cent. of sulphate of barytes, or 30 per cent. of plaster, while, of thirty-one specimens of flour examined at the laboratory, only thirteen were found to be pure.

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PRESERVATION OF HONEY.—Honey is known to contain about one per cent. of formic acid on the average, and M. E. Mylins, observing that crude honey kept better than clarified, determined to try the addition of formic acid, and did so with very satisfactory results. The acid seems to hinder fermentation without altering the taste of the honey.

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STRIKING THE HOURS BY ELECTRICITY.—A watchmaker, J. Lange, of Beziers, has invented a novel way of striking the hours by an electric bell. He takes the electric wire of a battery, which controls an electric bell, and attaches it to some metallic part of the movement of a clock. The positive wire, suitably insulated from other parts of the clock, is fastened so that its extremity will be just over the handle of the hammer. When the clock strikes the hammer rises, and its handle rubs the positive wire so as to form the contact. At the same moment the other bells, which are in the circuit, strike the same hours as the clock. The system might be applied to church bells, and a large bell might be swung by a little clock, so as to strike synchronously with it, by means of a sufficiently powerful electro-magnet.

Julius Cæsar.

ACT III.

Scene I.—Calpurnia is not here. Wisely, as the killing of her lord before her would have been unnecessary cruelty. And her absence is in keeping with her ill-ease all night and morning.

1. A dramatic beginning to a dramatic scene. The old man who warned him in Act I., scene ii., line 18, is here. Cæsar has forgotten neither his face nor his words. These have become part of his life now drawing to its end. He singles out the face that has haunted him these twenty-four hours, and reminds himself and all men of the words that have haunted him no less.

3. *Schedule.*—Probably a little shred. Sceadan = to divide, as in our 'watershed,' and 'ula' is a diminutive ending. But as 'ula' is classical and 'sceadan' is Teutonic, the word is a hybrid. The schedule is that which we heard read in the last scene but one.

4. The ready Decius!—Note the reversal of the usual order in the 'o'er-read.' It is a question whether Trebonius has in truth a suit. His part is the drawing off Antony, as we see in line 25 of this scene. But Artemidorus must be checked in some way or other, and Decius, whilst the rest are uncertain what to do, has the preventing pretence ready.

6. Here is indeed a situation—a conflict of emotions. Whether the prayer of Artemidorus prevail or not, what consequences follow!

7. A false move, here and now. Before the multitude Cæsar must assume a virtue if he have it not. The appeal would have been effectual in Cæsar's house, with Calpurnia for seconder. But before the eyes of men, unselfishness must be to the fore.

8. *Ourself.*—The regal plural is used.

10. And yet through the half angry question runs a wistfulness. He would give much to see the scroll.

12. *Come to the Capitol.*—The grim nature of Cassius is in this bidding. *There*, you will see anon whether he can grant or not.

13. A line that sets the heart beating. Does Publius know?

14. The question of Cassius comes from lips that are not blanched, but quiver with excitement none the less. He is perturbed, but he is not afraid. This, despite the dramatic stage direction, 'Publius advances to Cæsar,' and despite the lines that follow.

17. *I fear.*—Not as cowards fear. Call to mind how this man met death on the hill at Philippi. His dread is as to the failure of their plans, not as to his own fate.

19. *Casca.*—This fellow of 'quick mettle,' as Cassius knows, in any bold or noble enterprise, who has pledged himself to set his foot 'as far as who goes farthest,' has been chosen for the striking of the first blow.

20. The question is born of agitation, nothing more.

21. *Or.*—Perhaps on. If we read 'or,' the meaning is that neither of them will retreat. But the preposition 'on' is far more intelligible. I will never flee from Cæsar.

22. If we doubted the bravery with which he faced the doubtful words of Publius, or the meaning of his 'I fear' above, this line sets all at rest. Brutus' advice 'Be constant,' be firm, is needed to calm his excitement, not his fear. Of the two, Brutus is the more calm. His face is very firmly set, very pale.

23. The tension of actor and spectator alike on this point is, with great wisdom, relieved, and that other and stronger strain that has been growing since the scene began holds undivided sway.

24. *Change.*—Colour.

25. This withdrawal of Antony by Trebonius actually occurred. Remember how in Act II., scene i., 190, 191, this same Trebonius sides with Brutus in sparing the life of Antony.

27. Decius arranges and sees that others carry out that which is laid down for them as calmly as though it were a pleasure-party.

29. *Address'd.*—Ready. Shelley, in the first part of the 'Sensitive Plant,' singing of the flowers in that enchanted garden, tells of

> "The rose like a nymph to the bath addrest."

Press near.—The conspirators gather round Cæsar, shutting out one by one all other men.

30. A speech such as comes for a relief to the lesser man in such terrific moments as this. Nay, not alone for the lesser. Lady Macbeth after the murder says almost as mechanically as Cinna here, 'There are two lodged together.'

33. *Puissant.*—Powerful. One of the French words that found a temporary lodgment in our language. *Find other cases.*

36. *Couchings.*—Lyings down.

38. *Pre-ordinance.*—That which has been decided on before. He speaks not only in regal fashion, but as if he were a god.

39. *Fond.*—Foolish.

42. *With that.*—By that.

43. *Crooked.*—Bended. Used of the knees. We have the noun in the shepherd's crook.

44. Cæsar knows his errand ere he declares it.

47. Still using the language of the superhuman. His arrogance, his harshness throughout this scene are admirably worked up, so as to make us the less hard in our condemnation of Brutus and the rest.

51. *Repealing.*—Recalling.

52. *Kiss thy hand.*—None other does this. The lips of Brutus alone touch the hand of the doomed man, round whom this knot of stern-faced men is closing. The kiss is, indeed, not in flattery; it is a farewell.

55. A tenderness in the voice, as of old in addressing this friend. And thus we are led again to something of pity for him in his death.

60. *Northern star.*—The pole-star, brightest of the little group called the Lesser Bear (a Ursæ minoris). Round it, as on a pivot, all the planets and fixed stars of our solar system seem to turn. Perhaps in this comparison of himself with a star there is a part-reference to the fate awaiting him. *Sic itur ad astra.*

61. *Resting.*—Remaining. It continueth long in one stay.

62. *Firmament.*—A name founded on the old mistaken notion that the heavens were a kind of canopy over the earth.

67. *Apprehensive.*—Capable of apprehending.

69. *Rank.*—Place.

72. *Constant.*—In the sense of Brutus' 'Be constant,' in line 22.

74. *Olympus.*—A mountain of Macedonia and Thessaly, whose height was a mile and a half. The ancients held that Olympus touched heaven, and on its rainless, cloudless summit the gods dwelt in an eternal spring. In this reference to himself as like Olympus there is the reminder to us that his passage to the gods is close at hand.

75. *Bootless.*—Unavailing. The words 'but,' 'booty,' 'bootless' all convey the idea of addition, and are connected with 'but-an,' to add.

76. Casca has said never a word all this time. Now he speaks and strikes.

77. *Et tu, Brute.*—And thou, Brutus! This exclamation, familiar now in our mouths as a household word, does not occur in Plutarch. Suetonius has it that Cæsar cried, 'Καὶ σὺ τέκνον,' 'And thou, my son.'

80. *Pulpits.*—The rostra in the forum whence orators addressed the people. They took their name from 'rostrum,' the beak of a ship, as the prows of vessels taken in sea-fights were placed here.

83. *Ambition's debt.*—Whilst Cassius is thinking of the practical thing now to be done, Brutus is thinking of the abstract question of the justification for the killing.

85. In nothing does the shrewdness of Decius Brutus come out more clearly than in this advice. His kinsman is not the skilled speaker to the uneasy mob that Cassius is.

91. This conspirator in the abstract thinks all men will see things with his pure eyes, and believe him as he believes himself.

92. A double negative. This was even in the time of Shakspere equivalent to an affirmative. In 'Twelfth Night' (V. i. 22) the clown says: 'If your four negatives make your two affirmatives.' Cancel the two, and you have the modern rule.

93, 95. Cassius is generous, and Brutus is just, if ungrammatical.

96. This question shows the keen appreciation of the danger that is in Antony.

98. *Wives.*—Women. Wif = woman, as in housewife. In the phrase 'old wives' tales' we have the same use of the word.

99. *Fates.*—The Parcæ presided over births, lives, and deaths. Daughters of Night and Hell, Clotho, the youngest, watched the birth of men, Lachesis the life, and Atropos, 'with the abhorrèd shears,' would 'slit the thin-spun thread.'

100. Compare this calm phrase with the meditations of Cæsar on death (II. ii. 32-36).

101. *Stand upon.*—Attach importance to.

103. This also should be compared with the speeches of Brutus and of Cæsar.

104. He catches at any plea that seems to make the murder less a crime.

108. *Besmear.*—The first syllable has an intensive force. *Find other words in which it is used.*

110. *Red weapons.*—So hard to cry for peace and liberty when swords are of this colour! And yet in the world's history this has had to be.

113. *Scene.*—One of the many professional references that

Shakspere makes in his plays. He interweaves the drama with the drama.

116. *Basis.*—The base of the statue of Pompey. The earlier notes on the place of Cæsar's death at the feet of the image of the man he had ruined should be consulted here.

118. This flattering unction he lays to their souls and would lay to his.

120. Again the practical Decius! He brings them back from this speculation as to the future to the present emergency.

121. *Brutus shall lead.*—He sits high in people's hearts, as Casca put it at the end of the first act, and the conspirators have need of him.

122. *Most boldest.*—Double superlative.

Enter Servant.—Sent as an advanced guard by crafty Antony. The messenger was Antony's son, according to Plutarch.

124. The address is to Brutus. With his customary shrewdness Antony has divined that Brutus will be made the head of the conspiracy that he was well-nigh the last to join, and that in Brutus only lies his hope of safety.

127, 128. This contrast between the dead and living is the way to win Brutus' heart.

131. He has a perfect confidence in the word of Brutus.

132. *Resolved.*—Satisfied.

133. *Hath deserved.*—There is no suggestion that the death is not merited. All Antony's anxiety is to know how it was deserved!

137. *Thorough.*—A word fluctuating between the monosyllabic and dissyllabic form. Now, the monosyllable is the preposition, the dissyllable the adjective. *Untrod.*—The untrodden future towards which we now move.

140. *Worse.*—Less.

141. Note the omission of the preposition 'to' in the infinitive 'to come.' This marks a transition between the earlier form of the infinitive with its ending 'an' and the modern form with 'to.' In this case, as in other kindred ones, the ending has vanished and the preposition has not appeared.

142. *By my honour.*—This is enough. The servant leaves almost on the words, for which, doubtless, his master has bidden him wait.

144. The sanguine, open man thinks all natures as frank as his own.

146. *Still.*—Ever.

147. *Shrewdly.*—As an intensitive.

149. As nearly natural an outburst as can come from Antony, who, except when he is with Cleopatra, is always more or less of an actor. This sight of the slain friend and emperor moves him. But we must not forget how well he knows that this very emotion will tell in his favour with one of the conspirators at least, and possibly with all.

152. He gives just enough to Cæsar dead, and then quite bravely faces them.

153. *Rank.*—Overgrown, as with noisome weeds to-day. And here with the secondary meaning of full-blooded.

156. *Made rich.*—Your swords are rich being yours, and are made richer by his blood upon them.

157. *Of.*—In.

158. 'Ye' was used as nominative, 'you' as accusative. But the looseness of this arrangement is shown in this very passage, where the usual positions are reversed.

160. *Supply the two words omitted in this line.*

162. *Mean.*—Means. Only used now in the plural form, but used by Shakspere in both numbers.

163. The two 'by's have different significances.

164. And the 'choice and master spirits' has its double meaning also.

169. *This.*—With a gesture towards Cæsar full of dignity and of sorrow.

170. *Pitiful.*—In the active, not the passive sense.

172. Either the first 'fire' must be read as a dissyllable and the second as monosyllabic, or else both the 'pities' must be wrongly emphasized.

175. *In strength of malice.*—We grapple you to us with the force of antagonistic passion though we are friends.

176. *Temper.*—Mood generally; not an ill mood.

178. Brutus' appeal is as usual in the abstract. Cassius at once offers bribes.

183. Here is the key to the whole of Brutus in this action.

185. Note the order in which he salutes them. His swift perception sorts them out at once.

191. *What shall I say?*—Not altogether an affected embarrassment. He would gain time, and in truth, ready as he is, has his difficulty as to what is best to say.

193. *Conceit.*—Imagine.

197. *Dearer.*—More acutely. 'Dear' has often an intensitive sense.

[As the exigencies of time compel us to bring this review of 'Julius Cæsar' to a close in the present number, and as the close method of analysis of the play from the dramatic and philological standpoints has been conducted through the first two acts, and part of the third, we may now pass on more rapidly. A brief reference will therefore be made to the remaining scenes, and a thorough analysis be made of only one in the latter part of the tragedy.]

The rest of this first scene of the third act is taken up with Antony's request to speak over the body of Cæsar (line 228), a request demurred to by Cassius (234), but granted by the too generous Brutus, with the proviso that Antony speak where Brutus has spoken (251). This is more than Antony had hoped. He can desire no more (253).

Scene ii. shows the working of Antony's plot after his very wishes. Speaking after Brutus, he undoes all that the better nature has done, and by the end of the scene mischief is afoot (259), and the mob is on the track of the conspirators.

In scene iii. the poet Cinna is slain by the populace in error. They take him for his namesake the conspirator.

Act IV., sc. I., the triumvirs are making out their list of the proscribed. Really they met, not, as the play has it, in a house in Rome, but on an island formed by the river Rhine, in Bononia.

Note the rigid, mechanical way in which the three men devote to death man after man, with scarcely a pause on the name of nephew or of brother. Note also how, when Lepidus is sent on an errand by Antony, the other two fall to the picking of him to pieces as if they were nineteenth-century friends of one just left.

Scene ii. The forces of Brutus and Cassius meet.

Scene iii. The immortal quarrel of the two immortals takes place. Observe also the beauty of the introduction of the speech from Brutus, 'Portia is dead' (145), after the quarrel, and in the cry of Cassius, 'How scaped I killing when I crossed you so?' (148) hear the echo of the world-wide cry of friendship that has wronged a friend when he is smitten with grief. After the entering of Messala with his letters, we have a scene whose dramatic intensity is often lost by the reader. Look at lines 179-194. Messala as well as Brutus has had letters from Rome. He asks, 'Had you your letters from your wife, my lord?' Pressing his questions on this line for a moment he raises in the broken heart of Brutus the half hope that his own ill news is false, and that Portia yet lives. This you will see if you read his two answers (180, 182), his inquiry (183), and his command (185) to Messala. The half hope dies at Messala's reply, 'For certain she is dead.' But there is no more plaining than before. 'To our work alive,' he says, calmly. Nor must we omit reference to the beautiful scene with the boy Lucius, when the other generals are gone. Awakened to bear in the bowl of wine in which the two friends drown all memory of their quarrel, he dozes through the council scene, and at its end brings the gown to his worn-out lord. In its pocket Brutus finds the book as to the whereabouts of which there has been between Lucius and himself a little difference of opinion. To Lucius falls now the rare privilege, often recalled by him in after years, of soothing the sad heart of Brutus with music. It is his duty; he is only too willing to do it, late as is the hour, for Brutus' sake—nay, he has slept already. And so he plays until he falls asleep again. I have said he will recall in later times that evening. Not the least memorable part of it will be the touch of his master's hand upon the young head, the look of his master's eyes deep down into his upturned, the sound of the voice that said,

'If I do live,
I will be good to thee.'

The introduction of the ghost of Cæsar is effective as showing the over-wrought mind that the music would have soothed in some measure.

Act V. Its five scenes are occupied with the battle, and with the death of our two great ones. Two of the five are short and hurried intentionally, as with so many of Shakspere's battle-fields, but the events of the act are the death of Cassius by the hand of Pindarus, and of Brutus by his own deed. The pathos of the former is heightened by the fact that Cassius dies upon a misapprehension. Titinius in the distance is surrounded by friends, whom Pindarus and Cassius take for foes, and the last, upon this misunderstanding, elects for death.

To deepen the pathos of the end of Brutus not even this dramatic device is needed. His last words are full of a sublime dignity very touching.

'My bones will rest
That have but laboured to attain this hour.'

This hour! The hour of death, the goal of all labour, the crown of all ambition.

Lessons in Latin.

BY THE REV. A. D. CAPEL, M.A., CANTAB.,
Formerly Examiner of Schools to Cambridge Local Examinations Syndicate.

KEY TO EXERCISES.

EXERCISE 36.

A.

1. It is certain that Cicero spoke well. 2. He said that he had set the city on fire. 3. I hear that you said your lessons yesterday. 4. My father told me that he had hurt my mother. 5. I have come to see Rome. 6. He said that Hamilcar had left Africa. 7. He asked to come to Rome. 8. I advise you to write a letter. 9. It is an allowed fact. 10. Is it not certain that men must plough before they reap a harvest?

B.

1. Constat homines esse animalia. 2. Cæsar populo dixit se Gallos vicisse. 3. Nonne certum est omnibus laborandum esse ut vivamus. 4. Hieme homines urbem Romam reliquerunt. 5. Moneo te ut te laves. 6. Milites imperavimus ut arma deponerent. 7. Omnes sciunt Pyrrhum Epiri regem fuisse. 8. Constat Hannibalem magnum ducem fuisse. 9. Didici multa, sed pauca dico. 10. Inter quos Dido magna in sylva errabat.

EXERCISE 37.

A.

1. All this crowd which you see is helpless and unburied. 2. This is the place of shades, of sleep, and of sleep-bringing night. 3. We know and we seek and give this pardon in turn. 4. Let the author of the promised song love this, spurn that. 5. Celœne, the unhappy prophetess, alone sat on the lofty rock and breaks forth this voice from her breast.

6. ūn' īn | prŏecĕl | sā" cōn | sĕdĭt | rūpē Cē | loēnō]
īnfē | fīx vā | tēs" rūm | pīt qu' hānc | pĕctŏrĕ | vōcēm]

7. He slew those men who had fled from the city. 8. He breaks the same laws which he praises in the presence of the people. 9. This man is good, that bad. 10. Both Tullus and Ancus reigned; the former with his house was burnt (lit. burnt, *i.e.*, as a fire burns), the latter died of disease (Eng., a natural death).

B.

1. Is homo, qui fidem violavit, vitam suam amittet. 2. Eadem antea audivi quæ nunc mihi dicis. 3. Ex Horatio et Virgilio laudo illum, sed hunc amo. 4. Propter quam causam Brutus populum concitavit et Tarquinio ademit imperium. 5. Hi secundo milliario ab urbe trans amnem consederunt. 6. Corvus non solum victoriam, sed etiam nomen ei dedit. 7. Latini hoc quoque a Romanis exigere cæperunt, ut unus consul ex eorum alter ex Romano populo crearetur. 8. Hi Pyrrhum contra Romanos auxilium poposcerunt. 9. Is qui primum cum transmarino hoste dimicavit, ad Italiam venit. 10. Curius contra eum pugnavit, exercitum ejus cecidit et castra cepit.

LESSON XXXVIII.

THE VERB 'ESSE,' TO BE.

285. The present tense of 'Esse,' of which you have learnt one form, viz., 'est,' 'he is,' is very irregular and must be carefully learnt.

286. With the exception of this one tense the verb is regularly formed from its third person singular, *e.g.*, if you remember that 'erat' and 'sit' are the imperfect ind. and pres. sub. respectively, you can form the other five endings just as in regular verbs, thus:

eram, eras, erat, eramus, eratis, erant.
sim, sis, sit, simus, sitis, sint.

287. The perfect root of the verb is 'fu,' and the terminations the same as those of the perfect tenses of all other verbs.

288. The present tense is thus formed—

sum, es, est, sumus, estis, sunt.

In examining this we notice that the 1st pers. sing. and 1st and 3rd persons plural would be perfectly regularly formed supposing the 3rd pers. sing. had been 'sut.'

289. With regard to the other tenses, from what has been said in 286, the third persons singular need only be given, which are as follows:—

Indicative.		*Sub.*		*Infinitive.*
Imp.	Fut.	Pres.	Imp.	Pres.
erat	erit (pl. ĕrunt)	sit	esset	esse

The perfect tenses being given in 287.

290. The student is strongly recommended to make out a complete conjugation of this important and common verb.

291. VOCABULARY 38.

English.	*Latin.*		*Derivatives.*
Race, Clan	Gens	G. Gentis	Gentile
Far	Longe, adverb		
Civil	Cīvilis -e (*m. f. n.*)	R. Civilis (I. decl.)	Civilian
But	Autem, conj.		
Less	Mĭnūs, an adverb		
Noble	Nōbĭlis -e	G. Nobilis (I. decl.)	Nobility
Rest (ease)	Rēquies	G. Requiei	Requiem
To begin	Incĭpĕre	P. R. Incēp	Inceptive
Mortal	Mortālis, -e	R. Mortal	Mortality
More	Māgis (adv.)		
To weary	Fatīgare	R. Fatig	Fatigue
Certain, Sure	Certus -ta -tum (*m. f. n.*)	R. Cert	Ascertain
Happy	Beātus -ta -tum	R. Beat	Beatitude

EXERCISE 38.

A.

1. Sub (16) eo (37) Roma habuit (7) capitum (11) 83,000 civium (8) Romanorum, (20) cum (20) his (37), qui (27) in agris (5) erant. 2. Volscos (Volsci), quæ (27) gens non longe ab (31) urbe (7) est, vicit (23). 3. Et placuit (Eng., 'the people determined') ut imperium (19) annum (17) unum (31) (Eng., 'for one year') haberent, (7) ut civiles semper (33) essent. 4. Fuerunt igitur (30) anno (17) primo (20) quinque (17) consules (17). 5. Dictator (29) autem Romæ primus (20) fuit Lartius. 6. Quum (13) Romæ (Eng., 'at Rome') fui, Ciceronem vidi (27). 7. In urbe (7) eratis ut spectacula (14) videretis (27). 8. Post (17) eam (37) cepit (26) et Faliscos (Eng., Falisci; many Latin towns had names of a plural form, as Veii, Pompeii) non minus nobilem civitatem (14). 9. Nemo (17) semper (33) erit bonus (20). 10. Beatus fuisti quia (7) fuisti bonus (20).

B.

1. He took (26) Tusculum, which (27) state (14) is not far from (31) the city (7). 2. You are happy because (7) (you) are good (20). 3. And this (37)

(man) was the second (20) after (17) Tarquin, (17) who was (imperfect sub.) a general (2) against (17) his own (20) country (10). 4. This (37) will be the place (9) of the city (7) that (Latin proper form of 'is') the sure rest of (Eng., your) labours (12). 5. There was a time (17) in which the first (20) rest begins for mortals. 6. There was (perf. tense) no (31) enemy (10) within (30) Italy (20) which more wearied the Roman (20) valour (26). 7. The slave (7) will be happy. 8. You (sing.) would have been less noble. 9. Let him be certain. 10. My (20) city (7) will not be far from (31) your (20) (city).

LESSON XXXIX.

THIRD ROOTS OF VERBS AND PARTICIPLES.

293. The third root of verbs ends generally in 't,' sometimes in 's.'

294. There are very few Latin words which have not some derivative in English; and these English derivatives are formed from the third root of the corresponding Latin verbs.

295. One's knowledge, then, of an English derivative will almost always suggest the third root of a Latin verb; and in some instances where there are two third roots found, we shall also find two English derivatives. To take an example. The Latin of 'to bite' is 'mordēre'; we call 'a bit,' that is, a bite, a 'morsel,' which assures us directly that the third root of 'mordere' is 'mors.' Again, the Latin of 'to mix' is 'miscere.' We have two English words derived from this word, viz., 'mixture' and 'mist,' and we find there are two corresponding third roots of 'miscere,' viz., 'mixt.' and 'mist.' This is not only an interesting portion of our subject, but one from which the most of us get the greatest practical use.

296. The third roots of A, long E, and I verbs are found from the Pres. Roots by adding 'at,' 'it,' and 'it.' Short E verbs only add 't,' making proper euphonic changes according to rules given below. Thus, taking amāre, monēre, dicĕre, and audīre as examples:—

	Pr. Rt.	*Pf. Rt.*	*3rd Root.*	*Eng. Derivative.*
ā	Am.	Am-av	Am-at	Amatory
ē	Mon.	Mon-u	Mon-it	Monition
ĕ	Dic.	Dix (=c-s)	Dict.	Diction
ī	Aud.	Aud-iv	Aud-it	Auditor

297. In making the euphonic changes for short E verbs, we must remember the table of mutes we learnt in Par. 151, which we will here copy, and also add an additional name to these lines read vertically, viz., soft, middle, and aspirate.

		Soft.	*Middle.*	*Aspirate.*	*With Sibilant.*
Lip	sounds	p	b	ph	ps
Teeth	,,	t	d	th	s (mute omitted)
Throat	,,	c, k, q.	g	ch	x

Note.—The Latin Primers omit aspirates altogether, and call middle mutes soft, and soft mutes hard. I prefer to follow the division as given in all Greek grammars. The more the two languages can be shown to be connected the better.

298. If a mute be added to a root ending in a mute, the former of the two mutes thus brought together must, if necessary, be changed, so that it may be in the same vertical line with the other, and the same horizontal line with itself. Thus, if to reg. we have to add t, the 'gt' is changed into 'ct.'

299. It is when this rule would double a letter, as lud, ludt (changed into lutt) that we generally find the exceptional ending 's' for the third root, as in this verb, ludere, which has 'lus' for its third root.

300. There are four parts of the verb formed from the third root, viz., the two supines (as they are called) in 'um' and 'u' (to be discussed hereafter), the Future Active Participle in urus, as 'discessurus,' 'about to depart,' and the very important Perfect Passive Participle, which, with the verb 'esse,' 'to be,' forms all the perfect tenses of the Passive Voice.

301. The Fut. Act. Part. in 'urus' and the Perf. Pass. Part. in 'us' are declined like O and A adjectives, and—being partly adjectives—must agree with the nouns they refer to.

302. There ought, of course, to be six participles in all languages, viz., Past, Present, and Future in both voices; but in Latin there are only four, the Perf. Act. and the Pres. Pass. being wanting. Of the substitutes for these, and the two formed from the Present Roots, we will treat in a future Lesson.

303. VOCABULARY 39.

English.	*Latin.*			*Eng. Deriv.*
To burden	Onerāre	R. Onerar		Exonerate
Burning	Incendium	G. Incendii, n. g.		Incendiary
Desire (for)	Dēsīderium	G. Desiderii, n. g.		Desideration
Riches	Dīvītiæ (A decl. no sing.)			
To turn away	Avertere	P. R. Avert.	3rd R.	Avers.
Whether—or	Sive—sive, conj.			
	m. f. n.			
Unsuitable	Ineptus -ta -tum	R. Inept.		Inaptitude
Our	Noster -tra -trum	R. Nostr.		
Bald	Calvus -va -vum	R. Calv.		
Black	Ater -tra -trum	R. Atr.		
Weak	Infirmus -ma -mum	R. Infirm.		
To perfect	Perfĭcere	P. R. Perfēc.	3rd R.	Perfect.
Hour	Hora	G. Horæ.		Horoscope
By	A or ab (before a vowel) before the agent of Pas. Verb.			
Island	Insula	G. Insulæ		Insular
To direct (to a place)	Dīrigere	P. R. Direx	3rd R.	Direct
Verse	Versus	G. Versūs		Versify
Theatre	Theātrum	G. Theatri		Theatrical
To rise	Surgere	P. R. Surrex.	3rd R.	Surrect.
To rise (of the sun)	Orīri (only used in pass.)		3rd R.	Orit.
To shed	Effundere	P. R. Effūd.	3rd R.	Effūs.
To lull to sleep	Consōpire	No perf. R.	3rd R.	Consopit.
A fly				
To bite	Mordēre	P. R. Momord.	3rd R.	Mors.
To lay bare / To uncover	Nūdāre	R. Nud.		Nude
Jackdaw	Graculus	G. Graculi		
To ill-treat	Mulcare	R. Mulc.		
To give forth	Edo	P. R. Edid.	3rd R.	Edit.
Scarcely	Vix, an adverb			
Tempest	Tempestas	R. Tempestat.		Tempestuous
Shower	Imber	G. Imbris, m. g.		
To pour forth	Effundo	P. R. Effūd.	3rd R.	Effūs.
To rage	Furere	Furu, no P. R.		
To surround	Circumvenīre	R. R. Circumven	3rd R.	Circumvent.
Cavalry	Equitātus	G. Equitatūs		
Line of battle	Agmen	G. Agmĭnis		
To fetch water	Aquāre	R. Aqu.		Aquatic.
To feel	Sentīre	P. R. Sens.	3rd R.	Sens.
Pain	Dolŏr	G. Dolōris.		Dolorous.
One thing—another thing	Aliud—aliud			
To carry off / To snatch	Rapĕre	P. R. Rapu.	3rd R.	Rapt.
Leader	Dux	G. Dūc.		Duke.

304. EXERCISE 39.

A.

P. stands for Phædrus.

1. Naves (9) discessuras (31) frumento (10) onerarunt. 2. Captam (26) urbem (7) magno (20) incendio vastavistis (18). 3. Civitas (14) templa (17) deorum (27) imaginibus (22) ornatura (2) est. 4. Desiderium amissarum (20) divitiarum magnum (20) est. 5. Consules (17) contra (17) Afros (26) missi (5) ingentibus (29) præliis (26) eos (37) confecerunt (26). 6. Cœlo (27) receptus (29) propter (29) virtutem (26) avertit oculos (18) P. 7. Sive hoc (37) ineptum,

sive laudandum (Eng. 'to be praised') est opus (13), invenit (28) ille, (37) nostra perfecit manus (8) P. 8. Rediit (27) horâ dictâ (15) P. 9. Pompejus a Cæsare victus (23), in Cyprum insulam classem (20) direxit. 10. Populus (16) Romanus (4) auditis (4) in theatro Vergilii versibus surrexit.

B.

1. The sun (10) about to rise sheds upon the earth its (20) light (27), lulled-to-sleep by the night (29). 2. A fly bit the uncovered head (11) of a bald man. 3. The jackdaw having been badly (28) ill-treated began (37) to return (27) to his own (20) race (26). 4. Scarcely had he given forth these (37) (things), (when) a black tempest with (20) showers poured forth, rages. 5. These (37) are sure (38) riches (39) about-to-remain (23) always (33). 6. The elephants (37) surrounded by the cavalry receive (29) the weak into (4) the middle (35) (of the) line. 7. We will come (19) to the river (5) about to get water (Eng., 'to get water'). 8. You (35) wounded (17) by the enemy (10) will feel pain. 9. It is one thing to carry off girls (8), another to fight (10) with (20) men (18). 10. The leader about to lead (9) his army (19) to battle (26) died (perished 26) of disease (26).

LESSON XL.

DEMONSTRATIVE AND INTENSIVE PRONOUNS.

305. There is another demonstrative pronoun besides those given in Lesson XXXVII., viz., Iste, ista, istud, which, with the exception of retaining the old Gen. and Dat. forms in 'ius' and 'i,' is declined like O and A adj. Its meaning is 'that,' often implying contempt.

306. The intensive pronoun, Ipse, ipsa, ipsum, is declined in the same way with the same old Gen. and Dat. It may be translated by the addition of 'himself,' 'herself,' etc., or by 'very'; thus, 'ipsa verba' would mean 'the words themselves,' or 'the very words,' that is 'the actual words,' and not simply their meaning.

307. The interrogative substantive pronoun, 'Quis, quæ, quid,' 'who? or what?' except the two forms, quis, quid, is declined exactly like Qui, quæ, quod, given in Lesson XXVII.

308. VOCABULARY 40.

English.	*Latin.*			*Derivatives.*
Prince	Princeps	G. Principis		Principality
To oppress	Opprimere	P. P. Oppress	3rd R.	Oppress
Injury	Injūria	G. Injuriæ		Injurious
To add	Addere	P. P. Addid	3rd R.	Addit.
Insult	Contŭmēlia	G. Contumeliæ		Contumely
Mind	Mens	G. Mentis		Mental
To laugh	Dērīdēre	P. P. Derīs	3rd R.	Derīs.
To look	Spectare	R. Spect		Spectacle
To sit	Sĕdēre	R. Sĕd	3rd R.	Sess
To give	Dāre	P. P. Dĕd	3rd R	Dāt
An ass	Asĭnus	G. Asini		
To hate	Odisse	No pres. or 3rd roots		Odious
An end	Finis	G. Finis, m.g.		Final
Alas!	Heu! an interjection			
Land	Tellus	G. Tellūris		
At last	Denique, adverb			
To rest	Restare	P. P. Restĭt	3rd R.	Restĭt

	m.	*f.*	*n.*		
So great	Tantus	-ta	-tum	R. Tant	
Unworthy	Indignus	- na	-num	R. Indign., fol. by Abl.	
Untamed	Indŏmĭtus	-ta	-tum	R. Indomit	Indomitable
Sacred	Sācer	- cra	-crum	Sacr.	Sacrilege
Mortal	Mortālis		-le	G. Mortalis (I decl.)	
Better	Mĕlior		-ius	G. Melioris (Con. decl.)	
Immortal	Immortālis		-le	G. Immortalis (I. decl.)	

Delay	Mŏra	G. Moræ	
To disfigure	Fœdāre	R. Fœd	
Wound	Vulnus	G. Vulnĕris	
To consecrate	Sācrāre	R. Sacr.	
Anger	Ira	G. Iræ	Irate
For	Nam, a conjunction		
Counsel	Concĭlium	G. Concilii. n.g.	Conciliate
Fortune	Fortūna	G. Fortunæ	Fortunate
Face, Countenance	Vultus	G. Vultūs	
Same time	Sĭmŭl		
Silence	Sĭlentium	G. Silentii, n.g.	
Hunger	Fāmes	G. Famis	Famine
Gold	Aurum	G. Auri	Auriferous
To compel	Cōgere	P.R. Cŏēgi,	3rd R. Coact

309. EXERCISE 40.

A.

1. Ipsi principes illam (37) osculantur, (Eng., kiss) qua (27) sunt (38) oppressi, manum (8). Ph. 2. Quid facies (31) tibi (35) injuriæ qui (27) addideris (pf. sub.). contumeliam? Ph. 3. Jam (33) favor (29) mentes tenet (18), et derisuri non spectaturi, sedent. Ph. 4. Cui (27) hoc (37) dedisti? 5. Is (37) hostium (10) clamore (3) subito (33) territus, (3) suadebat (16) asino fugere (27). 6. Odi istum hominem (5). 7. Quem (an adj.) das finem, rex (8) magne, (20) laborum (12)? V. 8. Quæ ipse misera (28) vidi (27) et quorum (27) pars (1) magna (20) fui (38). 9. Heu! quæ (adj.) nunc (27) tellus, inquit (Eng., says he)? aut Quid jam (33) misero (28) mihi (35) denique restat?

B.

1. O light (27) of Troy (30), what so great delays have held (18) (you)? 2. What unworthy cause (37) has disfigured your face (pl.), or (17) why (33) do I perceive (37) these (37) wounds? 3. I myself saw (27) Neoptolemus. 4. I saw (27) Priam (Lat., Priamus, o. dec.) defiling (Lat., fædantem) with blood (37) the fires (13) which (27) he himself had consecrated. 5. O son (7), what so great grief (39) arouses (37) your (20) untamed angers? 6. For what counsel or (17) what fortune has now ('jam') being given (12)? 7. Whom (27) both ('que' appended) of men (5) and ('que' appended) of Gods (27) have I not accused (2)? 8. At the same time the very silence (plur.) frightens (3) me (35). 9. What, O sacred hunger for gold, do you not compel mortal breasts (37) (to do)?

(To be continued.)

ANSWERS TO
Pupil Teachers' Examination Papers.

OCTOBER 27.

FIRST YEAR.

Pupil Teachers at end of First Year.

Three hours and a half allowed.

Arithmetic.

MALES.

1. Divide the sum of the least and greatest of $\frac{3}{4}$ of $\frac{7}{8}$, $\frac{11}{12}$, $2\frac{1}{2}$ of $\frac{7}{10}$, $\frac{11}{15}$, by the difference between the other two.

(1) $\frac{3}{4}$ of $\frac{7}{8} = \frac{21}{32}$ $= \frac{168}{256}$

(2) $\frac{11}{12}$ $= \frac{176}{256}$

(3) $2\frac{1}{2}$ of $\frac{7}{10} = \frac{7}{2} \times \frac{7}{10} = \frac{49}{20} = \frac{196}{256}$

(4) $\frac{11}{15}$ $= \frac{176}{256}$

Sum of the least and greatest $= \frac{189+210}{288} = \frac{399}{288}$

Difference of the other two $= \frac{210-196}{288} = \frac{14}{288}$

$\frac{399}{288} \div \frac{14}{288} = \frac{399 \times 288}{288 \times 4} = 99\frac{3}{4}$. Ans.

2. What fraction of a guinea is equal to $\frac{3}{4}$ of £1·375?

$\frac{\frac{3}{4} \text{ of } £1{\cdot}375}{21\text{s.}} = \frac{27{\cdot}5\text{s.} \times 3}{21 \times 8}$

$= \frac{275}{560} = \frac{55}{112}$. Ans.

3. Find to three places of decimals the value of $\frac{{\cdot}0375 \times {\cdot}536}{{\cdot}75 - {\cdot}6975}$

$\frac{{\cdot}0375 \times {\cdot}536}{{\cdot}75 - {\cdot}6975} = \frac{{\cdot}0201}{{\cdot}0525} = {\cdot}382\ldots$

4. Find the rent of 69·48$\dot{3}\dot{6}$ acres at £4 12s. 6d.

Rent of 69·48$\dot{3}\dot{6}$ ac. at £4 12s. 6d. per acre =

£69·48$\dot{3}\dot{6}$ × $4\frac{1}{2}$ = £321 7s. 2·8$\dot{3}\dot{6}$d. Ans.

$4\frac{1}{2}$

8 | 347·4181

43·4272

277·9345

£321·3618

20

7·2308.

12

2·8$\dot{3}\dot{6}$

5. A man left $\frac{9}{16}$ of his fortune to each of his three sons, $\frac{1}{4}$ of the remainder to each of his three daughters, and the rest, which amounted to £196, to a charity. Find the whole amount of his fortune.

The 3 sons get $\frac{9}{16}$ and ∴ leave $\frac{7}{16}$;

The 3 daughters get $\frac{1}{4}$ of $\frac{7}{16}$ or $\frac{7}{64}$ and

∴ leave $\frac{7}{16} - \frac{7}{64}$ or $\frac{28-21}{64} = \frac{7}{64}$

$\frac{7}{64}$ of the fortune = £196

∴ 7 : 64 :: £196 : £1792. Ans.

FEMALES.

1. Find the value of 250 ac. 3 ro. 15 po., at £5 5s. per acre.

	£	s.	d.		
2 ro. = ½ of 1 ac.	5	5	0	= val. of	1 ac.
			10		
	52	10	0	= ,,	10 ,,
			5		
	262	10	0	= ,,	50 ,,
			5		
	1312	10	0	= ,,	250 ,,
1 ro. = ¼ of 2 ro.	2	12	6	= ,,	2 ro.
10 po. = ¼ of 1 ,,	1	6	3	= ,,	1 ,,
5 ,, = ½ of 10 po.	0	6	$6\frac{3}{4}$	= ,,	10 po.
	0	3	$3\frac{3}{8}$	= ,,	5 ,,
	£1316	18	$7\frac{1}{2}$	= 250 ac. 3 ro. 15 po. Ans.	

2. Find the L. M. C. of 21, 33, and 56.

3 | 21, 33, 56

7 | 7, 11, 56

1, 11, 8

∴ L. C. M. = 8 × 11 × 7 × 3 = 1848. Ans.

3. Compare the values of $\frac{13}{15}$, $\frac{11}{12}$, $\frac{19}{21}$, $\frac{23}{28}$, $\frac{31}{35}$.

L. C. denr. = 420.

∴ the fractions reduced to a com. den. =

$\frac{364, 357, 380, 345, 406}{420}$

Hence $\frac{19}{21}$ is the highest in value;

then in order $\frac{13}{15}$, $\frac{11}{12}$, $\frac{23}{28}$, and $\frac{31}{35}$. Ans.

4. Find the cost of carpeting a room 15 feet long by 12 feet wide with carpet 27 inches wide, at 3s. 2d. a yard.

Area of room = 15 ft. × 12 ft. = 180 sq. ft. = 20 sq. yd.

length of carpet $= \frac{20 \text{ sq. yd.}}{\frac{3}{4} \text{ yd.}} = 26\frac{2}{3}$ yd.

$26\frac{2}{3}$ at 3s. 2d. = £4 4s. $5\frac{1}{3}$d. Ans.

Grammar.

MALES AND FEMALES.

1. These pretty babes with hand in hand
Went *wandering up* and down;
But *never more could see* the man
Approaching from the town:
Their pretty lips with blackberries
Were *all besmeared* and dyed,
And *when they saw* the darksome night
They sat *them down* and cried.

—OLD BALLAD.

(*a*) Parse the words printed in italics in this verse.
(*b*) Analyse the seventh and eighth lines.

PARSING.

Wandering—incomplete part. predic. of 'babes.'
up—adv. of place, mod. 'wandering.'
never—(=no) neg. adv. of degree, mod. 'more.'
more—adv. of time, mod. 'could see.'
could see—irreg. trans. verb, *see*, *saw*, *seen*, pot. past indef., 3rd pers., plur., agr. with subj. (babes).
their—pronoun, poss. adj., qual. 'lips.'
pretty—adj., pos. deg., qual. 'lips.'
lips—com. noun, neut., plur., nom., subj. of 'were.'
all—adv. of deg., mod. 'besmeared.'
besmeared—complete part., predic. of 'lips.'
when—subord. temporal conj., introducing subord. sent.
they—demonst. pers. pron., 3rd pers., plur., mas. or fem., nom., subj. of 'saw.'
saw—same as above, indic., past indef., 3rd pers., plur., agr. with 'they.'
them—(=themselves) reflective pron., 3rd pers., plur., mas. or fem., obj., gov. 'sat.'
down—adv., of man., mod. 'sat.'

ANALYSIS.

Sentences.	Kind.	Subject.	Predicate.	Object.	Extensions.	Connective.
1. And they sat them down.	Principal	they	sat	them	down (manner) and sent. 3	and
2. And (they) cried.	Principal	(they)	cried		(sent. 3)	and
3. When they saw the darksome night.	subord. adv. (time) to 1 and 2	they	saw	the darksome night	when (time)	when

2. Give a list of relative pronouns; and make three sentences, in one of which the relative is nominative, in another possessive, and in the third the objective case.

The relative pronouns are who, which, that, as, what, who-so, who-soever, whoever, whichsoever, whichever.

Examples: 1. The man who (nom.) speaks little is wise.
2. He was a man whose (poss.) word was law.
3. I have done the thing which (obj.) I was not to do.

3. Say what is the meaning of the final syllable in each of these words, and give other examples—blu*ish*, blu*er*, blu*est*, blue*ness*.

FINAL SYLLABLE.	MEANING.	OTHER EXAMPLES.
ish	partaking of the quality of	whitish, brownish, boyish, sheepish
er	greater or less degree	redder, smaller, softer, harder
est	the greatest or least degree	reddest, smallest, hardest, loudest
ness	state or condition	redness, softness, hardness, loud-

Geography.

(*Answer either Question* 1 *or Question* 2, *not both.*)

1. Draw a full map of Wales; and describe, as accurately as you can, its mountain system and the course of its rivers. Insert the lines of latitude and longitude.

The greater part of Wales is occupied with the Cambrian range, which is properly an offshoot of the Pennines. The range consists of two parallel chains, one along the north, and the other along the south coast, with a connecting chain between their middle parts, running N. and S. The *northern range* contains Snowdon, the highest mountain in South Britain, 3590 ft. high. The *central chain* contains Cader Idris, 2950 ft. and Plynlimmon, 2463 ft.; and the *southern chain* has Brecknock Beacon, 3862 ft., and the Malvern Hills which approach the Cotswold Hills, on the opposite side of the Severn, a river which rises in Plynlimmon and derives its head waters and the right-bank tributaries from the Cambrian range. In general this range forms the water-parting between the Severn and the Bristol Channel on the one side, and the Irish Sea on the other. The Dee, the Clwyd, and Conway flow N., the Dovey, Ystwith, and Teify to the W., all into the Irish Sea; the Towey, Tawe, and Taff, into the Bristol Channel; the Rumney, Usk, and Wye, into the Severn.

2. Describe as you would to children Manitoba and the Hudson's Bay territories.

Many people are leaving this country every year to settle in the valley of the Red River, a stream flowing into the great Lake Winnipeg, which is also fed by the waters drained from the Rocky Mountains by the large river Saskatchewan.

This district is called Manitoba, and is about as large as Great Britain and Ireland. It grows some of the finest wheat in the world, and supplies excellent pasture for sheep and cattle. On every side of this district stretches the vast hunting-ground known as the North-West Territory. Here and there over this wild and desolate land are scattered few and far between the trading stations of the fur-traders belonging to the Hudson's Bay Company. Over it roam Red Indians and half-breeds, employed by this company as trappers of fur-bearing animals. The central station is Fort York on Hudson's Bay, and to this place the spoils of the trappers are brought and stored till the bay is free from ice in August. Then from Britain come ships bringing provisions and stores for the next winter, and exchange these for the furs which have been collected from all parts of the territory. The Hudson's Bay territory is about thirty times the size of Britain, and is drained for three or four months of the year by four rivers flowing east, and by another mighty river, the Mackenzie, flowing north into the Arctic Ocean.

3. Trace in words, the course of a vessel sailing round Australia.

A VOYAGE ROUND AUSTRALIA.

Leaving Sydney on the south side of Port Jackson, which is one of the finest harbours in the world, and passing Botany Bay and Cape Howe, we arrive at the coast of Victoria, the most flourishing of the Australian Colonies. Melbourne is the capital of Victoria, and stands on the Yarra Yarra. The channel between Victoria and Van Diemen's Land is called Bass's Strait, rather dangerous for navigation. The island of Van Diemen's Land, or Tasmania, has an area of 24,000 square miles. The coasts are in many parts steep and rocky. Hobart Town is the capital. We now reach the shores of South Australia, which lies west of Victoria. It is exceedingly productive of minerals, especially copper and lead. Proceeding north-west we arrive at Adelaide, the capital of the colony. It stands on an inlet of Spencer Gulf, at the entrance of which is Kangaroo Island. Passing Spencer Gulf, there is nothing of any importance till we come to West Australia, established 1829. Freemantle is its port, but Perth, farther inland, is the capital. Continuing northward, we pass the north-west cape, and inclining to the north-east, come to Van Diemen's Gulf, which is land-locked by the islands of Bathurst and Melville and Coburg Peninsula. We are now at North Australia, which has no government settlement at present. We now reach the Gulf of Carpentaria, the largest inlet on the Australian coast. Torres Strait, which separates Australia from New Guinea, is about ninety miles wide, and very dangerous to navigate. Here is Cape York, the most northerly point of the island-continent, and as there is nothing of any consequence, we proceed to Moreton Bay. This district promises to become an important agricultural settlement. In 1859 this district was formed into a colony under the name of Queensland. The chief town is Brisbane. We now arrive at New South Wales. This colony is bounded on the north by Queensland, and on the south by Victoria. Sheep-grazing is carried on to a great extent, and the chief exports are wool and tallow. After passing the thriving settlement of Port Macquarie, we come to Newcastle, with its coal mines, and then to Sydney, thus finishing the voyage round the island.

History.

1. During what period did the Romans remain in Britain? Mention some effects of this occupation.

The Romans under Julius Cæsar invaded Britain in 55, and again in 54 B.C., but the island was not subdued till Agricola's conquests (78-84). The Romans continued to occupy Britain till A.D. 410, when the legions were withdrawn to defend the empire.

During their occupation the Romans held the island as a military settlement, the conquerors bringing with them the splendour, the refinement, and the practical genius which distinguished their civilisation. Agriculture was so far developed that Britain could export largely to the Continent. Marshes were drained, woods cut down, and orchards planted. Young Britons were trained as soldiers and drafted off in numbers for service in the armies. Four great roads crossed the country between distant and important points; and remains of Roman walls and camps may still be seen, and Roman pottery and pavement are sometimes yet turned up by the workman. Christianity was introduced by them in the end of the second century.

2. Which part of the island was first converted to Christianity? Narrate the circumstances.

The first part of the island to be converted to Christianity was Kent.

After Gregory the Great became Pope he sent to Britain a band of priests headed by Augustine, who landed in Kent in 597. Ethelbert, king of Kent, had married a Christian wife, and he consented to hear Augustine and his companions. The meeting took place in the Isle of Thanet and in the open air. After hearing what they had to say, he gave them a house in the royal city of Canterbury. In a short time Ethelbert became a convert, and his example was followed by many of his subjects.

3. In 1013 who ruled over Britain? How did this come about?

Sweyn, king of Denmark, ruled over Britain in 1013. The way that this came about was as follows:—Ethelred the Unready being too cowardly to fight the Danes, bribed them by large sums of money to refrain from invasion. His policy, however, led to the coming of more hordes until, exasperated by their attacks, Ethelred massacred the Danish settlers in Britain. Among the murdered Danes was Gunhilda, sister of Sweyn. To avenge her death, Sweyn invaded Britain in 1003, burning and slaughtering without mercy. He had twice to be bought off, only to return with greater numbers, and at the end of 1013 Ethelred fled to Normandy, leaving Sweyn to occupy the throne.

Composition.

Write from memory the substance of the passage read to you by the Inspector.

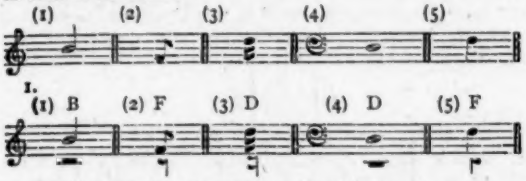
While I was waiting, says a traveller in Central Asia, for my tent to be prepared, one of the camel-drivers brought me a little bird resembling the water-wagtail, one of the rare inhabitants of the Steppe, and therefore an object of sympathy and interest to me. The men had injured the poor little thing in catching it, and gave it, wounded and half dead from fear, into my hand. I placed it in a hollow in the loose wall of the tent, where it was tolerably safe; at night, when my candle was lighted, it hopped out and took its seat on my bed. I was touched with the incident, and disposed my baggage, so as to shelter the poor little companion of my solitude. In the morning, my first care was to attend to my wounded guest. I found it lying dead in the spot where it had slept. I dug for it a little grave in the Steppe, and buried it there.

Music.

A quarter of an hour allowed for this paper.

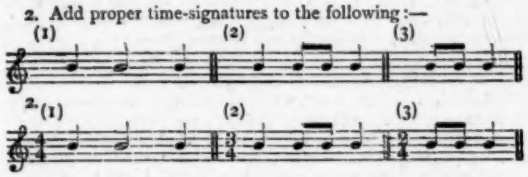
(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

1. Write above each of the following notes its pitch-name (C, D, &c.); and below write the signs for rests corresponding in value to the notes :—



1. (1) B (2) F (3) D (4) D (5) F

2. Add proper time-signatures to the following :—



2. (1) (2) (3)

3. Write below each of the following intervals its name (major fourth, &c.) :—

3. (1) (2) (3) (4)

Major 3rd. Perfect 4th. Major 6th. Pluperfect 4th.

TONIC SOL-FA NOTATION.

1. Write (1) a six-pulse tone, using three-pulse measure; and (2) a four-pulse tone, using two-pulse measure.

1. (1) |l :— :— |— :— :— ‖

(2) |l :— :— |— :— ‖

2. Write the names of the following intervals :—(1) *fah* to *lah*; (2) *soh* to *doh*^{1}; (3) *soh* to *me*^{1}; (4) *fah* to *te*.

2. (1) Major 3rd; (2) Perfect 4th; (3) Major 6th; (4) Pluperfect 4th.

3. Write the following an octave higher, and state what is meant by the direction "Key F" :—

KEY F.

|d :s, |m, :l, |s, :t, |l, :t, |d :— ‖

3. KEY F.

|d' :s |m :l |s :t |l :t |d' :— ‖

"Key F" means that after sounding C^1 on a tuning-fork, we are to run down the scale to F, and take it for the *doh* of our tune.

SECOND YEAR.

Pupil Teachers at end of Second Year.

Three hours and a half allowed for this Paper.

Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

1. Point out the errors in the following definitions, and give reasons for your corrections.

(*a*) A superficies is that which has length and breadth.

(*b*) A plane rectilineal angle is the inclination of two lines to one another.

(*c*) An acute-angled triangle is that which has an acute angle.

(*d*) A parallelogram is a figure of which the opposite sides are equal and parallel.

(*a*) A superficies is that which has *only* length and breadth. The introduction of 'only' precludes the idea of 'thickness.'

(*b*) A plane rectilineal angle is the inclination of two *straight* lines to one another, *which meet together but are not in the same straight line.*

The lines must be *straight*, and they must meet to show an angle.

(*c*) An acute-angled triangle is that which has *three* acute angles. Without 'three' the definition would suit obtuse, as well as right-angled triangles.

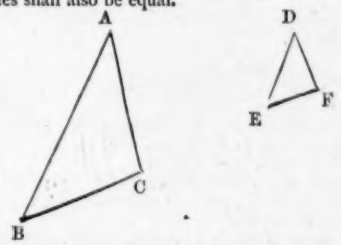
(*d*) A parallelogram is a *four-sided* figure of which the opposite sides are parallel. Unless the figure be defined as *four-sided* the definition would apply to some regular polygons; and the word 'equal' is not necessary.

2. If two triangles have two sides of the one equal to two sides of the other, each to each, and have likewise their bases equal: the angle which is contained by the two sides of the one shall be equal to the angle contained by the two sides equal to them, of the other.

What is the converse proposition? Show, by means of a diagram, that it is not true.

Prop 8, Bk. I.

The true converse proposition is—'If two triangles have the angle contained by two sides of the one equal to the angle contained by two sides of the other, then the two sides of the one shall be equal to the two sides of the other, and their bases or third sides shall also be equal.



The ∠BAC contained by BA and AC may be equal to ∠EDF contained by ED and DF, but it does not follow that BA = ED, or that AC = DF, for the size of the angle is not measured by the length of the containing sides, but by the inclination of the lines.

3. The greater angle of every triangle is subtended by the greater side, or, has the greater side opposite to it.

Prop. 19, Bk. I.

Arithmetic.

FEMALES.

1. A pays an income tax of £63 14s. 5½d. at the rate of 7d. in the £; find his income.

d.	£ s. d.		£	
7	63 14 5½	::	1	: Income
4	20			
28	1274			
	12			
	15293			
	4			
28 { 4	61173			
28 { 7	15293 5s.			
	£2184 15s. Ans.			

2. If $1\frac{7}{12}$ acres cost £118 13s., what will $10\frac{5}{7}$ acres cost?

$1\frac{7}{12}$ ac. : $10\frac{5}{7}$ ac. :: £118 13s. : ?

$£\frac{2}{19}\frac{1}{8}\frac{2}{0} \times \frac{7}{7} \times \frac{12}{19} = £\frac{339 \times 4 \times 3}{5}$

$= £\frac{4068}{5} = £813\ 12s.$ Ans.

3. Reduce to decimals $1\frac{3}{4} - \frac{7}{8}$ of $\frac{1}{16}$.

$1\frac{3}{4} - \frac{7}{8}$ of $\frac{1}{16} = \frac{7}{4} - \frac{7}{8}$

$= \frac{28 - 7}{16}$

$= \frac{21}{16} = 1{\cdot}1875.$ Ans.

4. The owner of three-eighths of a mine sold two-thirds of his share for £2,520; find the value of seven-eighths of the whole mine.

$\frac{3}{8}$ of $\frac{2}{3}$: $\frac{7}{8}$ :: £2,520 : ?

$\frac{£2520 \times 7 \times 8 \times 3}{8 \times 3 \times 2} = £8,820.$ Ans.

Grammar.

MALES AND FEMALES.

1. Clear *had the day been* from the dawn,
All chequered was the sky,
Thin clouds like scarfs of cobweb lawn
Veiled heaven's most glorious eye.
The wind had no more strength than this—
That leisurely it blew,
To make *one leaf the next to kiss*
That closely by it grew.—DRAYTON.

(*a*) Say in your own words what this passage means.
(*b*) Parse the words printed in italics.
(*c*) Analyse the second passage, from the fifth to the eighth line.

(*a*) The passage gives a beautiful description of a summer day. Light fleecy clouds moderated the heat of the sun, by screening him, and there was just enough of wind to ruffle one leaf against the other, and no more.

PARSING.

(*b*) *Had been*—irreg. intrans. verb, *am, was, been*, indic. pluperf., 3rd pers. sing., agr. with 'day.'
the—def. art. or dist. adj., limiting 'day.'
day—abstr. noun, neut., sing., nom., subj. of 'had been.'
all—adv. of degree, mod. 'chequered.'
chequered—complete part. predic. of 'sky.'
veiled—reg. trans. verb, indic., past indef., 3rd pers. plu., agr. with 'clouds.'
that—subord. conj., introd. noun sent.
leisurely—adv. of manner, mod. 'blew.'
it—pers. pron. neut., referring to 'wind,' 3rd pers. sing., nom., subj. of 'blew.'
blew—irreg. intrans. verb, *blow, blew, blown*, indic., past indef., 3rd pers. sing., agr. with 'it.'
one—num. adj., indef., qual. 'leaf.'
leaf—com. noun, neut., sing., obj. gov. by 'to make.'
the next—demonstr. adj., used as a noun, neut., sing., obj. gov. by 'to kiss.'
to kiss—reg. trans. verb. infin., pres. indef., gov. by 'to make.'
that—simple rel. pron., referring to 'the next (leaf),' 3rd pers. sing., neut. nom., subj. of 'grew.'

(*c*) ANALYSIS.

Sentence.	Kind.	Subj.	Predicate	Object.	Extensions.	Connective.
(1) The wind had no more strength	Principal	the wind	had	no more strength		
(2) than this	Subord. adv. of comparison to (1)	(it)	(had)	this (strength)		than
(3) that leisurely it blew to make one leaf the next to kiss	Subord. noun to (2)	it	blew		leisurely (manner) to make one leaf the next to kiss (effect)	that
(4) that closely by it grew	Subord. adj. to (3)	that	grew		closely by it (place)	that

2. Correct, if needful, these sentences, and give reasons for your correction :—

That is the best of the two.
He is a stronger man than me.
Whom did you say it was?

'That is the *better* of the two,' not 'the best,' because the comparative degree is used when two are compared.

'He is stronger than *I*,' not 'me,' because 'I' is the subject of 'am' understood, and therefore must be in the nominative case.

'Who (not 'whom') did you say it was?' 'Who' is in apposition with 'it,' and therefore in the same case, following, as it does, the verb 'to be.'

3. What are the exact meanings of these words, and of their parts :—Impose, interpose, expose, repose, depose, and suppose?

Words.	Exact Meanings.	Parts and Meanings.
impose	to place (something) upon	im, for in, 'upon' and ponere 'to place'
interpose	to place (something) between	inter, 'between' ,, ,,
expose	to place (something) out	ex, 'out' ,, ,,
repose	to place (oneself) back	re, 'back,' 'again' ,, ,,
depose	to place (some one) off	de, 'from' or 'off' ,, ,,
suppose	to place under	sub, 'under' ,, ,,

Geography.

Answer two questions.

1. Write a letter, as from a Norwegian visiting Italy for the first time, describing to his friends at home what he had seen, and the differences between Italy and his own country. How would he be led, in this description, to mention *latitude?*

Rome, 27th October, 1883.

My Dear Friends,—Having reached this wonderful city, I shall attempt to give you a few of the differences between our own country and this sunny land of Italy.

On entering the country I was ashamed at my attempts to speak the language, for the euphonious Italian sounded strangely from the mouth of one accustomed to the harsh gutturals of the north. The coinage gave me little trouble, seeing that like our own it is a decimal system, the only difference being the names of the coins.

I took advantage of the railways, which are on a more extensive scale than with us, and as I was carried along from city to city, I could not resist making comparisons. The Italians are handsome, lively, and intelligent, and have, generally speaking, a dark complexion, expressive countenances, dark, sparkling eyes, and black hair. They thus form, as you must see, a striking contrast to their light-haired, blue-eyed visitor.

I admired their beautiful and well-built cities, so superior to our wooden structures, though I confess I prefer our own roomy dwellings. You are aware that we are considered the best lodged people in Europe. We cannot at all compete with this nation in music, painting, and sculpture, neither have we a history like theirs.

In the appearance of the country the Italians have nothing so grand as our fiords, our numberless rivulets tumbling in countless waterfalls down wild ravines, and forming those clear and picturesque lakes for which our land is famed; yet, taking the country on each side of the Appenines, which form a back-bone to Italy, we find both sides covered with vineyards and olive groves, from which peep out white villas and picturesque villages. Everywhere there are gardens adorned with terraces, statues, and artificial lakes. The whole is seen under a blue sky of singular brillancy, and through an atmosphere which gives wonderful distinctness to every object.

The plains of Lombardy and Piedmont in the north are rich in vineyards and mulberry groves, from which they have become the silk region of Italy. Our country lies too far north and has too severe a climate to allow Norway to have a silk region. The latitude of Italy being well to the south of the temperate zone, gives it a more genial climate.

In the north of Italy winter is scarcely felt; and snow is never seen in the south.

We have no cities to compare with Milan, Florence, Venice, Naples, Rome, and though my patriotism leads me to love my native land, yet my reason prompts me to give the superiority in natural advantages to Italy.

Your affectionate countryman,
'THE TRAVELLER.'

2. Describe fully a voyage round the coast of Hindostan, from Bombay to Madras. Illustrate by a map. Insert the lines of latitude and longitude.

Leaving Bombay, the capital of the Bombay Presidency, we notice the Island of Elephanta with its caves, temple, and idols, cut out of the rock, and sail southwards passing the Portuguese possession of Goa and the considerable port of Mangalore. A little further south is Calicut, formerly noted for the manufacture of cotton goods, and hence the word 'calico.' While we are on the Malabar coast we must visit Cochin, which stands on a tongue of land separated from the shore by a salt lagoon. Next to Bombay, this is the best port on this coast, though its trade has much declined. Skirting the coast of Travancore we pass

Trivanderam, and doubling Cape Comorin, we enter the Gulf of Manaar between India and the Island of Ceylon. Sailing northwards through Palks Passage, we pass Tranquebar, the French possession of Pondicherry, and then arrive at Madras, situated on the Coromandel coast, the capital of the Madras Presidency and a port, having an extensive trade with Britain and the United States.

3. Describe, as for children, a Canadian winter.

In Canada the winter climate is far more severe than anything to which we are accustomed in Britain. In this country, except in very long and unusually hard winters, there are few days on which some work cannot be done on the land by farm labourers. In the eastern parts of Canada the land is sealed up all the winter by a deep covering of snow, and during this period those persons whose only employment is farming, can find little to do. To while away the time of enforced idleness in winter the Canadians have resort to various amusements, and the following is a very common pastime among children. They take two boards, each about two feet long and a foot wide. On one edge of each board, one end of which is rounded, is fastened a strip of iron. The other edges are fastened together, about fifteen inches apart, by boards laid across. Placing this sledge on the top of a snow slope, two persons wrapped in furs seat themselves on the planks, the hindermost clasping the foremost round the chest. The sledge, guided by the feet of the foremost, glides down the slope, and if it be steep, the pace becomes very fast. This is called *toboggining*. On the lakes the Canadians have fine opportunities of skating, and enjoying the Scotch game of 'curling.' The flesh of animals used for food is frozen when winter sets, and keeps good till the spring thaw begins. The people, like the Esquimaux, fish by making a hole in the ice, and letting down the bait. Many Canadians also gain their living by trapping furred animals that find it hard to get food, and are thus easily taken. Lumbering or cutting timber in the forest is also a great winter employment.

Winter is the time when the Canadians visit their friends. It is very amusing to see visitors making their way over the snow in their snow-shoes on a beautiful moonlight night; and one cannot forget a winter scene in Montreal streets when the squares are alive with sleighs, and the air musical with the sleigh-bells.

SECOND PAPER.

Needlework.

Two hours and a half allowed.

FEMALES.

(The needlework specimens will be collected by the Inspector at the expiration of one hour after the distribution of the examination papers.)

Arithmetic.

MALES.

1. What principal lent out at compound interest for 2 years at 5 per cent. per annum will amount to £7425 6s. 9d.?

Compount interest of £100 for 2 yrs. at 5 p.c. = £10 5s.
Amount " " " = £110 5s.

£	s.		£	s.	d.	£
∴ 110	5	:	7425	6	9 ::	100 : ?
20			20			
2205			148506			
12			12			
26460			1782081			

$$\frac{£100 \times 1782081}{26460} = £6735. \quad \text{Ans.}$$

2. What sum must I invest in the 3 per cents. at 99½ in order to obtain an income of £45, brokerage being ¼ per cent.?

£3 is got £99½ + ¼ or £99¾
∴ 3 : 45 :: £99¾ : sum required.

$$£99\tfrac{3}{4} \times \tfrac{45}{3} = \frac{£199 \times 45}{2 \times 3} = £1492\ 10s. \quad \text{Ans.}$$

3. If 20 horses plough 15 acres in 7 days, in how many days will 24 mules plough 36 acres, if 5 mules do as much work as 3 horses?

3 horses = 5 mules
1 horse = ⅔ mules ∴ 20 horses = 33⅓ mules

15 ac. : 36 ac.
24 mules : 33⅓ mules
:: 7 days : time.

$$\frac{7 \text{ days} \times 36 \times 33\tfrac{1}{3}}{15 \times 24} = \tfrac{70}{3} \text{ days} = 23\tfrac{1}{3} \text{ days.} \quad \text{Ans.}$$

4. If a man invests money in 4½ per cent. railway debentures at 124½, what per cent. does he get for his money, the usual brokerage being charged?

124½ × ¼ or 125 brings £4½
∴ 125 : 100 :: 4½ : percentage required

$$\frac{4\tfrac{1}{2} \times 100}{125} = \tfrac{450}{125} = 3\tfrac{3}{5} \text{ p.c.} \quad \text{Ans.}$$

5. What change would be made in a man's income by his transferring £5000 stock from the 3 per cents. at par to 4 per cent. railway debentures at £125?

(*a*) £125 : £5000 :: £4 : 2nd income

$$\frac{£4 \times 5000}{125} = £160.$$

(*b*) £100 : £5000 :: £3 : 1st income

$$\frac{£3 \times 5000}{100} = £150.$$

difference in income = £(160 − 150) = £10. Ans.

History.

MALES AND FEMALES.

1. What was Domesday Book? Explain its object and importance.

In 1084, William the Conqueror ordered a survey to be made of all the landed property of the kingdom, probably as a guide for the levying of taxes. The original record is still in existence, and is known as Domesday Book. It consists of two volumes, which contain the names of every town and village, the names of estates, their value, size, divisions, and owner, with other information. It is of very great importance as a survey of England at the time of the Norman Conquest.

2. What claim did Edward III. assert to the French Crown? and with what consequences?

Edward III. asserted his right to the French crown because his mother Isabella was a daughter, as Charles IV. was a son of Philip IV. In 1337 Edward put forth his claim, and assumed the title of King of France, in opposition to Philip of Valois, who had roused Edward by supporting the Scots, and by encroaching upon Aquitaine. A war broke out which, from its long continuance, has been called the 'Hundred Years' War.'

3. What produced the Wars of the Roses, and how did they end?

In the reign of Henry VI. a contest for power arose between the Dukes of Somerset and of York. Edmund Beaufort, Duke of Somerset, was the representative of an illegitimate branch of the House of Lancaster. Richard II. had, with the consent of Parliament, conferred upon the Beauforts the rights of lawful birth, but doubts were even yet entertained about their claims to the throne.

Richard Plantagenet, Duke of York, inherited through his mother the claim of the line of Clarence upon the crown, his name was a household word, and his exclusion from the king's councils for some time had been a ground of complaint. In 1454 Henry VI. became temporarily imbecile, and York was made Protector; but when Henry recovered, Somerset was again in the ascendant. York, supported by the Earls of Salisbury and of Warwick, then took up arms, and slew his rival on the field of St. Albans, 1455. There was a hollow peace for a time, but in 1459 civil war again broke out. These contests are called the Wars of the Roses, because the badge of Lancaster was a *red rose*, and that of York a *white* one.

These wars were only terminated by the victory of the Lancastrian Henry Tudor, Earl of Richmond, at Bosworth Field, over Richard III., in 1485. The victor afterwards married the eldest daughter of Edward IV., and thus united the rival houses.

Teaching.

Show how you could help a scholar to form a multiplication table for himself before learning it by heart.

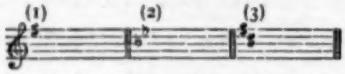
After a scholar knows simple addition he can easily be taught to form a multiplication table, seeing that multiplication is a shortened form of addition; 2+2+2 or 3 times 2 being 6; 3+3+3 or 3 times 3 being 9. After he understands this, the sign of multiplication (×) may be shown and explained, as also the sign (=) 'equal to'; thus 2 × 3=6 can be read three times two is 6. Hence, by adding 2+2 he gets 2 × 2=4; by adding 3+3, he gets 3 × 2=6; by adding 4+4, he gets 4 × 2=8, and so on. The same mode of procedure may be followed with three times, etc., and the results written perpendicularly, as is generally done in tables of the sort.

Music.

A quarter of an hour allowed for this paper.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

1. Write the key-signatures of each of the following major keys :—(1) of G ; (2) of B flat ; (3) of D.

1. 

2. Write below each of the following intervals its name (major second, &c.) :—

3. Add proper time-signatures to the following :—

TONIC SOL-FA NOTATION.

1. Write the names of the following intervals :—(1) *lah*, to *me* ; (2) *doh* to *fah* ; (3) *te*, to *fah* ; (4) *fah* to *te*.

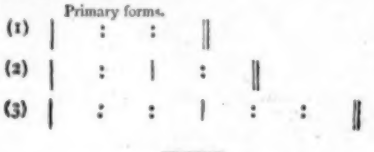
1. (1) Perfect 5th ; (2) Perfect 4th ; (3) Diminished 5th ; (4) Pluperfect 4th.

2. Which tones of the scale have the strongest leaning tendency?

2. *Fah* and *te*.

3. Write (1) a three-pulse measure ; (2) a four-pulse measure: and (3) a six-pulse measure

3. Primary forms.



THIRD YEAR.

Pupil Teachers at end of Third Year, *if apprenticed on or after 1st May, 1878* ; **and Pupil Teachers at end of Fourth Year,** *if apprenticed before that date.*

Three hours and a half allowed.

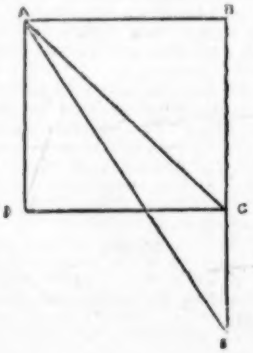
Euclid.

[All generally understood abbreviations for *words* may be used.]

Answer two Questions, including Question 1, if you can.

MALES.

1. ABCD is a square: a line drawn through A cuts CD, and meets BC produced at E. Show that AE is greater than AC.



In the $\triangle$ AEC the exterior angle ACB which is less than a right $\angle$ is greater than the interior and opposite $\angle$ AEC ; much greater is the $\angle$ ACE which is greater than a right $\angle$ than the $\angle$ AEC. Now since the greater $\angle$ is subtended by the greater side $\therefore$ AE is greater than AC. Q. E. D.

2. If a straight line fall upon two parallel straight lines, it makes the alternate angles equal to one another ; and the exterior angle equal to the interior and opposite upon the same side ; and likewise the two interior angles upon the same side together equal to two right angles.

Prop. 29, Bk. I.

3. Parallelograms upon equal bases and between the same parallels, are equal to one another.

Prop. 36, Bk. I.

Algebra.

Answer two questions.

1. Multiply $a^4-2a^3b+4a^2b^2-8ab^3+16b^4$ by $2b+a$.

$$\begin{array}{l} a^4-2a^3b+4a^2b^2-8ab^3+16b^4 \\ a+2b \\ \hline a^5-2a^4b+4a^3b^2-8a^2b^3+16ab^4 \\ \quad +2a^4b-4a^3b^2+8a^2b^3-16ab^4+32b^5 \\ \hline a^5 \qquad\qquad\qquad\qquad +32b^5. \end{array}$$ Ans.

2. If $x=\frac{1}{2}$ and $x+y=x+y+z=0$, find the value of $(y^2-z^2)\{y^2+z^2-y(x-z)\}$.

(*a*) $(y^2-z^2)\{y^2+z^2-y(x-z)\}=$

(*b*) $(y^2-z^2)\{y^2+z^2-xy-yz\}$

Now $x=\frac{1}{2}$

and $y=-x=-\frac{1}{2}$

and $x+y+z=0$ or $z=-(x+y)=-(\frac{1}{2}-\frac{1}{2})=0$

hence by substitution in (*b*) $(-\frac{1}{2})^2-(0)^2\{(-\frac{1}{2})^2+(0)^2-(\frac{1}{2})(-\frac{1}{2})-(-\frac{1}{2})(0)\}=\frac{1}{4}\times(\frac{1}{4}+\frac{1}{4})=\frac{1}{4}\times\frac{1}{2}=\underline{\frac{1}{8}}$. Ans.

3. Solve the equations :—

(1) $3-(-7x+6)=2-(-3x)$.

(2) $\frac{3x+1}{4}=\frac{9x+8}{12}-\frac{x+1}{x+8}$

(1) $3-(-7x+6)=2-(-3x)$

$3+7x-6=2+3x$

$7x-3x=2+6-3$

$4x=5$

$x=\underline{1\frac{1}{4}}$. Ans.

(2) $\frac{3x+1}{4}=\frac{9x+8}{12}-\frac{x+1}{x+8}$ or $\frac{3x+1}{4}-\frac{9x+8}{12}=-\frac{x+1}{x+8}$

$\frac{9x+3-9x-8}{12}=-\frac{x+1}{x+8}$

$-\frac{5}{12}=\frac{x+1}{x+8}$

$5x+40=12x+12$

$7x=28$

$x=\underline{4}$. Ans.

Mensuration.

1. Find the area of the triangle whose sides are 533, 875, and 888.

$$\frac{533+875+888}{2}=\frac{2296}{2}=1148.$$

Area of $\triangle=\sqrt{1148\times(1148-533)\times(1148-875)\times(1148-888)}$

$=\sqrt{1148\times615\times273\times260}$

$=\sqrt{50113299600}$

$=\underline{223860}$. Ans.

Arithmetic.

FEMALES.

1. Divide 1121·4 by ·534, and multiply the quotient by ·001

(*a*) $\frac{1121\cdot4}{\cdot534}=2100$

(*b*) $2100\times\cdot001=\underline{2\cdot1}$. Ans.

2. A digs $\frac{5}{8}$ of a field in 11 days ; and then, with B's help, does the rest in 4 days. How long would each take to dig the whole field?

(*a*) A does in 11 days $\frac{5}{8}$

$\therefore$ he ,, ,, 1 day $\frac{5}{88}$

$\therefore \frac{3}{8}\div\frac{5}{88}=\underline{17\frac{3}{5}}$ days time A takes. Ans.

(*b*) Now A and B in 4 days do $\frac{1}{2}$
or A and B ,, 1 day ,, $\frac{1}{8}$
$\therefore \frac{1}{11} - \frac{1}{8} = \frac{33-20}{352} = \frac{13}{352}$ what B does in 1 day.
and thus B takes $\frac{352}{13}$ or $27\frac{1}{13}$ days. Ans.

3. If 2·75 lb. tea cost 12s. 9d., what will $\frac{3}{16}$ lb. cost?
$2\frac{3}{4}$ lb. : $\frac{3}{16}$ lb. :: 12$\frac{3}{4}$s. : ?
$\frac{153\text{d.} \times 3 \times 4}{16 \times 11} = \frac{459}{44} = 10\frac{19}{44}$d. Ans.

4. If $\frac{1}{2}$ of a sheep be worth £$\frac{3}{4}$, and $\frac{1}{4}$ of a sheep be worth $\frac{1}{15}$ of an ox, find the value of 100 oxen.
$\frac{1}{15}$ ox = $\frac{2}{1}$ sheep
1 ox = 6 sheep
$\therefore$ 100 oxen = 600 sheep
Hence $\frac{1}{2}$ sheep : 600 sheep :: £$\frac{3}{4}$: ?
$\frac{£2 \times 600 \times 5}{3} = £2000$. Ans.

Grammar.

MALES AND FEMALES.

1. Paraphrase this passage :—

'In full-blown dignity see Wolsey stand;
Law in his voice and Fortune in his hand;
To him the Church, the realm, their powers consign;
Through him the rays of regal bounty shine;
Turned by his nod the stream of honour flows,
His smile alone security bestows;
Still to new heights his restless wishes tower;
Claim leads to claim, and power advances power;
Till conquest unresisted ceased to please,
And rights submitted left him none to seize.'
JOHNSON—'*Vanity of Human Wishes.*'

We can in imagination see the great Wolsey in all his magnificence of earthly pomp, deciding legal questions, and dealing out to favourites lucrative appointments. All ecclesiastical and civil government was in his hands, and the king's favours could only be obtained through him. His approval was a sure guide to success, and without his favour no one could find himself secure. His ambition was never satisfied, but forced him on from one stage of power to another until everything yielded to him, and he could rise no higher.

2. Take the words *dignity*, *regal*, *restless*, and *submit*. Explain the meaning of their parts, and give examples of other words formed in the same way.

WORD.	PARTS.	EXAMPLES.
dignity	dignus (worthy) ty (noun ending)	lucidity, humility, falsity.
regal	rex. (king) and -al (adjective ending)	legal, corporeal, mural.
restless	rest. and less (adjective ending)	toothless, heedless, powerless.
submit	sub (under), and mit for mittere (to send)	subject, subtend, subtract.

3. Make a complex sentence, containing an adjective sentence and an adverbial sentence, besides the principal; and show by example the difference between a sentence and a phrase.

(*a*) The hill that you see in the distance commands a fine prospect when you reach the top.
(*b*) A boy *of a good disposition* (phrase) is loved by all.
A boy *who is of a good disposition* (sentence) is loved by all.

4. Parse the sentence :—

I had as lief not be, as live to be
In awe of such a thing as I myself.

Explain the two different uses of the word 'be' in this sentence.

I—pers. pron., 1st pers. sing., mas. (or fem.), nom., subj. of 'had.'
had—(=would) irreg. intrans. verb, *have*, *had*, *had*, indic., past, indef., 1st pers., sing. agr. with 'I.'
as—adv. mod. 'lief.'
lief—adv. mod 'had.'
not—neg. adv. mod. 'be.'
be—irreg. intrans. verb, *am*, *was*, *been*, infin., pres., indef., gov. by 'had.'
as—subord. conj. connect. 'be' and 'live.'
live—reg. intrans. verb, infin., pres., indef. gov. by 'had.
to be—same as above, gov. by 'live.'
in—prep. gov. 'awe.'
awe—abstr. noun, neut., obj., gov. by 'in.'
of—prep. gov. obj. case 'thing.'
in awe of—prep. phrase gov. 'thing.'
such—indef. adj. qual. 'thing.'
a—indef. art. or adj. qual. 'thing.'
thing—com. noun, neut., sing., obj. by 'of' or 'in awe of.'
as—rel. pron., neut., sing., nom. after ('am').
I—same as above, nom., subj. of 'am.'
myself—comp. pers. pron., giving emphasis to 'I.'

The first 'be' signifies 'to live' or 'exist,' the second mere fact.

Geography.

(*Answer either Question* 1 *or Question* 3, *not both.*)

1. Give notes of a lesson on 'The General form of Asia and Africa, as compared with Europe, and the advantages which Europe possesses.'

AFRICA.—Taking the Old World as divided into the three portions of Europe, Asia, and Africa, and comparing them as regards (1) length and indentation of coast-line on seaboard, (2) long, large, navigable rivers, and (3) good climate, we find that Africa has in many parts a poor coast-line, few harbours for its size, and much unhealthy climate. With the exception of the north and the extreme south, the whole of that immense land is given over to barbarism. What might Africa not have been if its vast bulk had been pierced by a Mediterranean sea to admit ships and commerce into its interior! Its coast, unfortunately, is singularly free from indentations, and its shores almost destitute of islands. The surface consists of a narrow low-lying seaboard, bounded by lofty mountains running parallel with the coast. Great deserts are a distinctive feature of Africa. Near the Equator are magnificent lakes, recently discovered, forming the long-sought sources of the Nile. The chief rivers of Africa are characterised by periodic inundations, but they are of little commercial value, their navigation being impeded by cataracts, as in the Nile and Congo, by shoals, as in the Zambesi, and by pestilential swamps, as in the Niger. From position, configuration, and surface, Africa is naturally the hottest and driest of the continents.

ASIA.—Of the mainland of Asia, India and China are the only fully peopled, industrious, prosperous portions. The reason of this is that China has an indented coast-line, with estuaries and harbours; and both have long, large, navigable rivers, and climates which, though not entirely good, are tolerable. On the other hand, Arabia, with a rocky seacoast and no rivers, is a desert. The countries of Central Asia are cut off from the rest of the world by their elevation and want of connection with the sea, and their severe climate; while the people of the vast plains of Siberia, one-fourth larger than the whole of Europe, watered by three of the noblest rivers in the world, have these advantages rendered useless by the extreme cold, and are wild and uncivilised, and mainly dependent on hunting, fishing, and other precarious modes of living.

EUROPE.—Europe contrasts favourably with the foregoing. In length of coast-lines it is far better off than the other continents. No circumstances more favourable to navigation and commerce can be imagined than the deeply-indented coasts of Asia Minor and the Grecian Archipelago (where European commerce first began), Italy, with its double coast-line and its three great adjacent islands, or the equally irregular outline of England, Scotland, and Ireland. We may compare the Japanese Islands with the United Kingdom, the Japanese being the most enlightened and liberal of Eastern Asia. The rivers of Europe, though far behind those of Asia for size, are far before them for convenience and commerce. The Russian rivers are worthy of consideration by themselves for their navigableness, and the flatness of the country which they drain. The climate of Europe escapes extremes. Europe has neither the long droughts nor the violent deluges of rain which afflict Asia and Africa, nor the typhoon winds and cyclone waves which are so destructive. The ocean isolates it from the Polar regions, softens and equalises the temperature of its coasts; the Gulf Stream cherishes and moistens its western shores.

2. Draw a map of the coast-line of Hindostan, from Bombay to Madras. Insert the lines of latitude and longitude.

3. Explain, as to children, the words '*Hurricane*,' '*Monsoon*,' '*Typhoon*,' '*Tornado*,' '*Trade-wind*,' and give instances of their effects.

Hurricane is a remarkable storm-wind peculiar to certain portions of the world, and especially to the regions of the West Indies in the northern, and to the Mauritius in the southern hemisphere. A hurricane travels round and round as well as forward, blowing the sea with it in a whirling current. Within the circle of the hurricane the air is calm, and from this fact the water is lifted up in a great wave, which becomes a deluge if it strikes upon the shore; but otherwise it rolls on and on. The word has been jocularly derived from the fierce storm 'hurrying off the sugar-canes' in the West Indies.

Monsoons are regular periodical winds which sweep over the Indian Ocean and the whole of Hindostan, as the sun moves into the northern or southern hemispheres. They blow for six months in a northerly direction, and for other six in a southerly direction. The period of their changing is marked by great and terrible storms. They are, however, very serviceable to sailors, as it often happens that a ship is wafted by a monsoon to a distant port, and enabled to return by their shifting in an opposite direction.

A *Typhoon* is a storm of wind somewhat resembling a hurricane. It is met with only in the Chinese Sea, not so far south as Mindanao nor so far north as Corea, except upon the eastern borders of Japan. It causes fearful destruction to shipping.

A *Tornado* is a sudden tempest of the most furious and destructive kind affecting the Indian Ocean. At Midnapore, about nine years ago, 3000 people died from the force of the wind alone.

Trade-winds are winds which blow during the entire year in one general direction, a regular steady wind from east to west. This they do in the Atlantic and Pacific Oceans from one year's end to the other, in a belt of about 30 degrees on each side of the Equator. These winds are great helps to navigation, but before the invention of steamers they were of the greatest importance to mariners, and, indeed, they got their name from the assistance they gave to trade. In many parts of the Pacific a vessel may sail for a week without altering the position of a sail or rope.

SECOND PAPER.

Two hours and a half allowed.

Arithmetic.

MALES.

1. Find the value of $\sqrt{\cdot 5} - \sqrt{\cdot 5}$ correct to three places of decimals.

(*a*)

7 | ·55('745...
49
144 | 655
576
1485 | 7955
7425
...

(*b*)

7 | ·50('707...
49
1407 | 10000
9849
...

·745 − ·707 = ·038. Ans.

2. A man invests £5000 in railway stock at 75, and sells out at 76¾; find his gain per cent. (Omit brokerage.)

Gain on 75 = 1¾
∴ 75 : 100 :: 1¾ : gain p. c.

$\frac{7 \times 100}{4 \times 75} = \frac{7}{3} = 2\frac{1}{3}$. Ans.

3. If four men do as much work as 7 women or 10 boys, and 12 men, 21 women, and 30 boys working together for 6 days earn 36 guineas, what will be the wages of each man, woman, and boy per day?

4 men = 7 women = 10 boys.
∴ 12 ,, = 21 ,, = 30 ,,
12 men + 21 women + 30 boys earn 6 guins. per day
But the whole together = 36 men, or 63 women, or 90 boys.
∴ in 1 day a man earns $\frac{1}{36}$s. = 3s. 6d. Ans.

,, woman ,, $\frac{1}{63}$s. = 2s. Ans.

,, boy ,, $\frac{1}{90}$s. = 1s. 4⅘d. Ans.

4. Find the cost of carpeting a room, whose length is 20¼ feet and breadth 15¾ feet, with carpet 27 inches wide, at 4s. 6d. per yard.

Area of room in sq. ft. $= 20\frac{1}{4} \times 15\frac{3}{4}$
,, ,, ,, $= \frac{81 \times 63}{4 \times 4}$ sq. ft.
Length of carpet required $= \frac{81 \times 63}{4 \times 4} \div 2\frac{1}{4}$ ft.
,, ,, ,, $= \frac{81 \times 63 \times 4}{4 \times 4 \times 9} = 15\frac{3}{4}$ ft.
Price of a lineal ft. = 4s. 6d. ÷ 3 = 1s. 6d.
∴ Price of carpet $= 1\frac{1}{2}$s. $\times 15\frac{3}{4}$
$= \frac{3 \times 567}{2 \times 4}$s.
$= 106\frac{1}{8}$s.
= 212s. 7½d. = £10 12s. 7½d. Ans.

5. A man has a bill for £3489 5s., due 7 months hence. What would a broker give him for it, the rate of interest being 4½ per cent. per annum?

Int. on £100 for 7 mos. at 4½ p.c. = $\frac{7}{12}$ of 4½ = £$3\frac{1}{8}$
Amt. of ,, ,, ,, = £$103\frac{1}{8}$
∴ $103\frac{1}{8}$: 100 :: £$3489\frac{1}{4}$: pres. val.

£$3489\frac{1}{4} \times \frac{100}{103\frac{1}{8}} = \frac{13957 \times 800}{4 \times 821}$
= £17 × 200 = £3400. Ans.

History.

MALES AND FEMALES.

1. How was James I. related to Henry VII.? Show that his father, mother, and son died violent deaths.

James I. was related to Henry VII. through his mother Mary, Queen of Scots, who was the daughter of James V. James V. was the son of James IV. and Margaret Tudor, daughter of Henry VII.

Lord Darnley, father of James I., was murdered in the Kirk-of-field—it was supposed by Bothwell and accomplices.

His mother, Mary, was executed in Fotheringay Castle 1587.

His son, Charles I., was beheaded in front of Whitehall Palace 1649.

2. What event in English History is known as the Revolution? How was it brought about?

The Revolution is the name given to the deposition of King James II., and the giving of the Crown to William, Prince of Orange.

James, in defiance of all his promises to the contrary, took every means at his disposal to overturn Protestantism and establish Roman Catholicism. He attacked the Universities and the Church, published a Declaration of Indulgence suspending the penal laws against Nonconformists, and dispensing with religious tests. By the issue of a second Declaration of Indulgence, a petition was presented against it by six bishops and Sancroft, Archbishop of Canterbury. Then followed the famous Trial of the Seven Bishops, and their acquittal. During these exciting times the nation endured James's misgovernment in the belief that the next reign would set things right. But the birth of a son to James changed the whole aspect of affairs, and the leading malcontents took the decisive step which resulted in the abdication of James, and the enthronement of William and Mary, 1689

3. What was the condition of this country between 1773 and 1783?

These ten years form a most important epoch in the history of the British Empire. During the seventeenth and eighteenth centuries the gradual development of her vast commercial and military resources had excited the wonder and jealousy of surrounding states; and France could not readily forget the triumphant peace obtained in 1763. That power was therefore easily prevailed upon to promote the independence of the American colonists, who had been in revolt against the mother country since the time when the men of Boston threw the taxed tea into the harbour (1773). France sent a force to their assistance, 1778; and Spain, thinking her opportunity for vengeance had come, declared war 1779. In 1780 Holland was added to the number of her enemies; while Russia, Sweden, and Denmark formed an armed neutrality hostile to her cause. A hostile fleet rode unopposed in the English Channel, 1779, notwithstanding the unexampled exertions which Britain put forth. These fearful

difficulties from without were aggravated by internal disorders of an alarming nature. In 1778 formidable riots took place in Edinburgh, Glasgow, and other cities, and in 1780 the Gordon rioters retained possession of London for five days. The strength of the Empire, however, was found equal to the crisis. The internal disorders were quelled; Gibraltar was retained after a siege of three years (1779–83); Rodney vanquished the Spanish fleet (1780); and that of France in 1782. Though the peace of Versailles terminated in the dismemberment of the empire, Britain afterwards attained, partly by that very dismemberment, an unexampled height of commercial prosperity.

Teaching.

Show how you would give to young children their first notion of the meaning and use of a map.

After making sure, by frequent exercising, that the children have a clear knowledge of the four cardinal points, by referring to places north, south, east, or west of the school, and by showing the necessity for using such terms to describe exactly the position of one place as compared with another, a ground-plan of the school, with its rooms, furniture, windows, doors, and fireplaces, may be drawn upon the blackboard. The playground may be shown enclosed by its wall, the roads leading from the school, the natural and other objects (if any) placed in position north, south, east, or west according to the directions of the scholars.

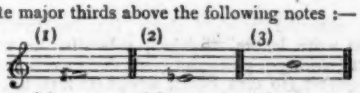
Plans of gardens, with ponds, streams, etc. in them, may be depicted on the board, to be copied and explained by the children, and this may be followed by the scholars making plans of their own homes, showing also the routes to school, from which they can be led to see the use of maps in guiding travellers from place to place.

A rough outline-map of the district in which the school is situated may now be introduced, and the roads, railways, streams, etc., indicated. Now, by requiring the children to show the direction they would take to go from the school to a neighbouring place, they will be led to see the use of maps as guides to people who can read them.

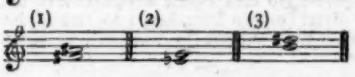
Music.

A quarter of an hour allowed for this paper.

1. Write major thirds above the following notes :—

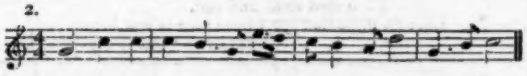


1.



2. Add bars in their proper places to the following :—

2.



3. State (briefly) the meanings of the following :—(1) M. 80; (2) *Rallentando*; (3) 𝄐

3. (1) "M. 80" means that the note against which this mark is placed, is to be sounded the 80th part of a minute, or "M" on the Metronome is to be placed against the line marked 80; (2) *Rallentando* means a slackening of the speed; (3) the sign 𝄐 means a hold or pause on the note over which it is placed.

TONIC SOL-FA NOTATION.

1. Write major thirds above the following notes :—(1) *ray*; (2) *ta*; (3) *te*.

1. (1) *Ray* to *fe*; (2) *ta* to *ray*^{1}; (3) *te* to *re*^{1}.

2. Re-write the following in two-pulse measure, halving the value of each note :—

| m :-.s | s :f | r :t, | f .s :m ‖

2. | m .,s :s .f | r .t, :f,s.m ‖

3. State (briefly) the meanings of the following :—(1) M. 80; (2) *Rallentando*; (3) 𝄐

3. (1) "M. 80" means that the note against which this mark is placed, is to be sounded the 80th part of a minute, or "M" on the Metronome is to be placed against the line marked 80; (2) *Rallentando* means a slackening of the speed; (3) the sign 𝄐 means a hold or pause on the note over which it is placed.

FOURTH YEAR.

Pupil Teachers at end of Fourth Year, *if apprenticed on, or after,* **1st *May*, 1878; and Pupil Teachers at end of Fifth Year,** *if apprenticed before that date.*

FIRST PAPER.

Three hours and a half allowed.

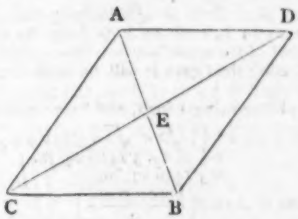
Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

Answer two Questions, including Question 1, *if you can.*

1. AB, CD intersect at E, and the triangle AEC is equal to the triangle BED; show that BC is parallel to AD.



Let AB, CD, intersect at E, and let $\triangle AEC = \triangle BED$; then AD is $\parallel$ BC.

$\triangle AEC = \triangle BED$, to each of these equals add $\triangle AED$; then $\triangle CAD = \triangle BAD$, and they are upon the same base AD; $\therefore$ they are between the same parallels (I. 39), and $\therefore$ AD is $\parallel$ BC.

Q. E. D.

2. To describe a square on a given straight line.

Prop. 46, Bk I.

3. If a straight line be divided into any two parts, the square on the whole line is equal to the squares on the two parts, together with twice the rectangle contained by the parts.

Prop. 4, Bk. II.

Algebra.

Answer two Questions.

1. Divide $5y^4+\frac{7}{3}ay^3-\frac{107}{18}a^2y^2+\frac{4}{3}a^3y+\frac{1}{9}a^4$ by $\frac{2}{3}y^2+3ay-\frac{1}{3}a^2$.

$\frac{2}{3}y^2+3ay-\frac{1}{3}a^2)5y^4+\frac{7}{3}ay^3-\frac{107}{18}a^2y^2+\frac{4}{3}a^3y+\frac{1}{9}a^4(2y^2-ay-\frac{1}{6}a^2$.

$5y^4+6ay^3-\frac{1}{2}a^2y^2$

$-\frac{2}{3}ay^3-\frac{1}{6}a^2y^2+\frac{4}{3}a^3y$

$-\frac{2}{3}ay^3-3a^2y^2+\frac{1}{3}a^3y$

$\frac{5}{6}a^2y^2-\frac{1}{3}a^3y+\frac{1}{9}a^4$

$\frac{5}{6}a^2y^2-\frac{1}{2}a^3y+\frac{1}{12}a^4$

2. Simplify $\frac{1}{2x+2}-\frac{4}{x+2}+\frac{9}{2(x+3)}-\frac{x-1}{(x+2)(x+3)}$

L. C. denr. $=2(x+1)(x+2)(x+3)$

$\therefore$ therefore the fractions reduced to a com. den. $=$

$\frac{x^2+5x+6-8x^2-32x-24+9x^2+27x+18-2x^2+2}{2(x+1)(x+2)(x+3)}=$

$\frac{2}{2(x+1)(x+2)(x+3)}=$

$\frac{1}{(x+1)(x+2)(x+3)}$ Ans.

3. Solve the equations :—

(1) $ax+1=by+1=ay+bx$

(2) $\frac{x}{x+1}+\frac{x+1}{x}=1\frac{1}{6}$

(1) $ax+1=by+1$

$ax=by$

$x=\frac{by}{a}$

$\therefore by+1=ay+b\left(\frac{by}{a}\right)$ substituting for x

$by+1=ay+\frac{b^2y}{a}$

$aby+a=a^2y+b^2y$

$a^2y-aby+b^2y=a$

$y=\frac{a}{a^2-ab+b^2}$. Ans.

hence $x=\frac{b}{a^2-ab+b^2}$. Ans.

(2) $\frac{x}{x+1}+\frac{x+1}{x}=\frac{13}{6}$

$6x^2+6x^2+12x+6=13x^2+13x$

$6x^2+6x^2-13x^2+12x-13x=-6$

$x^2+x=6$

$x^2+x+\frac{1}{4}=6+\frac{1}{4}=\frac{25}{4}$

$x+\frac{1}{2}=\pm\frac{5}{2}$

$x=\pm\frac{5}{2}-\frac{1}{2}$

$=2$ or -3. Ans.

Mensuration.

The radius of a circle is $\sqrt{2}$ inches; two parallel straight lines are drawn in it, each an inch from the centre; find the area of the part of the circle between the straight lines.

By constructing the figure it will be seen that there are *two sectors*, each equal to $\frac{1}{4}$ area of circle, and *two triangles*, the perp. height of the latter being 1 inch, and base = 2 inches.

$\therefore$ Area of sectors $=\frac{1}{2}(\sqrt{2}\times\sqrt{2}\times 3{\cdot}1416)$ sq. in.

$=\frac{1}{2}$ of $2\times 3{\cdot}1416$ sq. in.

$=3{\cdot}1416$ sq. in.

Area of $\triangle$s $=2\left(\frac{\text{Base}\times\text{perp.}}{2}\right)$

$=2\left(\frac{2\times 1}{2}\right)=2$ sq. in.

$\therefore$ Area of enclosed space $=3{\cdot}1416+2=\underline{5{\cdot}1416}$ sq. in.

Arithmetic.

FEMALES.

1. If a skirt take $2\frac{1}{2}$ yards, a bodice $\frac{3}{4}$ of a yard, and a pelisse $1\frac{3}{4}$ yards of stuff, what quantity will be needed for 84 skirts, 63 bodices, and 120 pelisses?

$2\frac{1}{2}$ yds. $\times$ 84 = 189 yds.

$\frac{3}{4}$,, $\times$ 63 = $47\frac{1}{4}$,,

$1\frac{3}{4}$,, $\times$ 120 = 210 ,,

$\underline{446\frac{1}{4}\text{ yds.}}$ Ans.

2. Three planets are seen together, they perform their courses round the sun in 87, 232, and 1218 days respectively. When will they be seen together again?

Find the L.C.M of the numbers.

2	87, 232, 1218
3	87, 116, 609
29	29, 116, 203
	1, 4, 7

$2\times 3\times 29\times 4\times 7=\underline{4872}$. Ans.

3. The rates of running of A and B are as 14 to 11. If A give B 36 yards start, how far must the winning-post be for A to get in by the same distance?

Here A gains 3 yards in 14, how far will he have to run to gain 72?

3 : 14 :: 72 yds. : Distance required.

$\frac{72\text{ yds.}\times 14}{3}=\underline{336}$. Ans.

4. A having £36,000 in the 3 per cents. sells out at 95, and invests one third of what he gets in the $3\frac{1}{2}$ per cents. at 96. At what interest must he lend the rest so as to increase his income by £113 16s. 8d.?

By 1st sale he realises $\frac{36{,}000\times 95}{100}=£34{,}200$.

$\frac{1}{3}$ of £34,200 = £11,400 to be invested in the $3\frac{1}{2}$ per cents. at 96.

Original income $=\frac{£36{,}000\times 3}{100}=£1080$.

New income = £1080 + £113 16s. 8d. = £1193 16s. 8d.

£11,400 brings $\frac{£11{,}400\times 3\frac{1}{2}}{96}$ of income = £ 395 16s. 8d.

Income required from £22,800 = £ 798 0s. 0d.

$\therefore$ £22,800 : £100 :: £798 : Interest required.

$\frac{£798\times 100}{22{,}800}=\underline{3\frac{1}{2}}$. Ans.

5. At what rate per cent., simple interest, will £4562 17s. 10½d. amount to £5,630 in 7 years?

Interest per annum $=\frac{1}{7}$ of (£5630 − £4562 17s. 10½d.)

$=\frac{1}{7}$ of £1067 2s. 1½d.

= £152 8s. 10½d.

£	s.	d.	£	s.	d.	£
4562	17	10½	152	8	10½	100
20			20			
91257			3048			
12			12			
1095094			36586			
2			2			
2190189			73173			
			100			

: Rate per cent.

$2190189)7317300(3\frac{7{,}117{,}511}{21{,}901{,}89}$ per cent. Ans.

6570567

746733 (Nearly $3\frac{1}{3}$ per cent.)

2190189

Grammar.

MALES AND FEMALES.

1. The infinitive is sometimes called the substantive mood. Explain this, and give some sentences in which the infinitive is equal to a noun.

The infinitive mood is sometimes called the substantive mood because it may be used as either the subject or object of a sentence, as:

To err, is human; *to forgive*, divine (subj.).
To walk in the fields in summer is pleasant (subj.)
To learn is the scholar's duty (subj.)
He attempted *to conquer* his weakness (obj.)
The earnest pupil likes *to study* (obj.)
They wish *to do* well (obj.)

2. Take the two Latin verbs *scribo* and *verto*, and give as many English derivations from them as you can, with the meaning of each.

Scribo—describe (to write about), inscribe (to write in), prescribe (to write before, appoint), subscribe (to write under), scriptures (writings), postscript (something written after), etc.

Verto—avert (to turn from), advert (to turn to), convert (to change), divert (to turn from, hence to amuse), invert (to turn on the other end), subvert (to overturn), pervert, reverse, con verse, etc.

3. Analyse this sentence:—

'In the golden lightning
Of the sunken sun,
O'er which clouds are brightening,
Thou dost float and run,
Like an unbodied joy whose race is just begun.'

SHELLEY.—'*Ode to the Skylark.*

Sentences.	Kind.	Subject.	Predicate.	Extensions.	Connectives.
(1) In the golden lightning of the sunken sun thou dost float, like an unbodied joy.	Principal	thou	dost float	in the golden lightning of the sunken sun (place) like an unbodied joy (manner)	
(2) and run.	Principal (Contracted)	(thou)	(dost float)	do.	and
(3) O'er which clouds are brightening.	Subord. Adj. qual. 'sun' in (1)	clouds	are brightening	o'er which (place)	which
(4) Whose race is just begun.	Subord. Adj. qual. 'joy' in (1)	whose race	is begun	just (time)	whose

4. What is meant by the 'Revival of Learning,' in England? Say when it happened, and what effect it had upon the English language.

About the same time that printing was invented there was a great revival of learning going on in Europe. By the taking of Constantinople by the Turks, fugitive scholars went to Italy, and revived there the study of Greek and Roman literature. By-and-by the new learning spread to France and Germany; and in the beginning of the sixteenth century it took root firmly in England. Classical studies were prosecuted with an ardour previously unknown. One effect of this soon showed itself in the introduction of a great many words derived from Latin and Greek. Most of the words of Latin origin which form such a large element in our modern speech were adopted at, or after this time, and constitute what is called the *Latin of the fourth period*. In many cases a word was taken direct from Latin which had previously been taken indirectly from it through Norman-French; as—*fact* and *feat*; *faction* and *fashion*; *hospital* and *hôtel*; *legal* and *loyal*; *secure* and *sure*.

Geography.

(*Answer either Q. 1 or Q. 3.*)

1. Give notes of a lesson to Standard V. on the globe; illustrating from it the causes of the seasons, and of Day and Night.

I. THE SEASONS.—*Place a lighted lamp to represent the sun, and show the globe representing the earth successively in four positions in its orbit 90° apart, namely,* (1) *the position it has on the 21st of March, or at the time of the vernal equinox;* (2) *that of the 21st of June, or the summer solstice;* (3) *that of the 21st of September, or the autumnal equinox; and* (4) *that of the 21st of December, or winter solstice.*

CAUSE OF THE SEASONS.—In the annual motion of the earth, its axis preserves at all times the same direction, as if its motion round the sun had no existence, and is carried round parallel to itself, and pointing always to the same spot among the fixed stars. (*Refer to globe, showing and explaining parallelism of the earth's axis.*) This is what gives rise to the variety of seasons.

EXPLANATION.—In each of the positions of the earth (the diurnal rotation not interfering with annual motion), since the sun can only illumine one-half of the surface at once (*refer to globe*), the shaded portion in the various positions of the earth will represent the dark and the bright will denote the enlightened halves of the earth's surface. Now, in position (1) it is day over half the northern and half the southern hemisphere at once; and as the earth revolves on its axis every point of its surface describes half its diurnal course in light and half in darkness—that is, day and night is equal over the globe; hence the term *equinox*. The same thing holds good at the autumnal equinox in the position 3. In position (2) it is the time of the *northern* summer solstice. Here the north pole (*refer to globe*) and a considerable portion of its neighbourhood are situated within the *enlightened* half. As the earth turns on its axis in this position, the whole of that part is constantly illumined, giving continual day in the *arctic circle* (*explain*), while in the *antarctic circle* there is continual darkness. Again, the nearer any point is to the north pole the longer will be its day and the shorter its night, and every spot north of the equator will have a day of more and a night of less than twelve hours' duration, and every spot south of the equator a longer night and a shorter day. In position (4) all these phenomena are exactly reversed.

N.B.—During the lesson appeal to what the children themselves have observed in the changes of the year, and explain all the terms, using the blackboard freely.

II. DAY AND NIGHT.—Earth's daily rotation causes day and night, sun always shining; but earth being like a ball only one half of it can receive the light at a time; when one side is lighted by sun, the other half is in darkness (*this readily shown by means of lamp*); when our side of the globe is lighted it is *day* with us; and when our side is away from the sun it is *night* with us; when it is midday in Britain it is midnight in New Zealand.

2. Draw a full map of South America. Insert the lines of latitude and longitude.

3. Explain, as to children, the terms '*Hurricane*,' '*Monsoon*,' '*Typhoon*,' '*Tornado*,' '*Trade-wind*,' and give instances of their effects.

See No. 3 answered under 'Third Year.'

SECOND PAPER.

Arithmetic.

Two hours and a half allowed.

MALES.

1. How much money must a man invest in the 3 per cents. at 99½ to get a dividend of £160, the usual brokerage being charged?

£3 is got from £99½
∴ £3 : £160 :: £99½ : ?
$\frac{£795 \times 160}{8 \times 3} = £5300$ Ans.

2. A dealer buys 100 sheep at £2 10s. each, and sells them at the end of 3 months for £3 each, what per cent. does he gain on his outlay, the cost of keep, payable at the time of sale, being £25?

	£
100 sheep at £2 10s.	= 250
100 ,, £3	= 300
Gained by sale	= 50

He pays away £25 of the profit.
∴ 250 : 100 :: £25 : Gain per cent.
$\frac{25 \times 100}{250} = \underline{10 \text{ p. c.}}$ Ans.

3. Find in the form of a recurring decimal the value of—

$$\frac{\cdot\dot{7}2\dot{9} \times \cdot083}{6\cdot25 - 3\cdot\dot{5}71428}$$

$$= \frac{\frac{7}{9}\frac{2}{9}\frac{9}{9} \times \frac{7}{9}\frac{3}{0}\frac{0}{0}}{6\frac{1}{4} - 3\frac{4}{7}}$$

$$= \frac{(\frac{1}{7} \times \frac{1}{1}\frac{1}{0}) \div 2\frac{1}{2}\frac{1}{8}}{}$$

$$= \frac{27 \times 1 \times 28}{37 \times 12 \times 75}$$

$$= \underline{\frac{3}{1}\frac{1}{3}\frac{1}{5} = \cdot0225}.$$ Ans.

4. A man added 20 per cent. to his capital each year, and in 4 years it amounted to £5,184; what was his capital at first?
Amount of £100 for 4 years at 20 p. c. at compound interest
= £207·36
∴ £207·36 : £100 :: £5184 : Capital at first.
$\frac{£5184 \times 100}{207\cdot36} = \underline{£2500}.$ Ans.

5. A boy was told to multiply a fraction by ⅗, but he divided it by ⅜, and the result was 1⅛⅞ too large. What was the fraction?

He multiplied by ⅜ instead of ⅗
∴ his answer will be $(\frac{3}{8} - \frac{3}{5})$ or 1⅛⅞ too large.
Hence the fraction = $1\frac{1}{8}\frac{7}{8} \div \frac{9}{4}\frac{1}{0} = \frac{1}{8} \times \frac{4}{9} = \underline{\frac{1}{2}\frac{1}{8}}$. Ans.

History.

MALES AND FEMALES.

1. What do you understand by English History? Why should all of us have some acquaintance with it?

English History is a narration or description of the transactions, actions, or events of the country of England, or of her kings, delivered in their proper order or relation. It may be described as the biography of the political society or commonwealth of England.

No person can be at all educated unless he knows history, and especially the history of his own country. Without this knowledge he cannot understand the allusions in a political speech, nor works bearing upon the national growth. Indeed, not to know the history of our country is to be always a child. To our knowledge of the past, a lively and extensive knowledge of the present must be added, for this enables us to point out the advance made on the ages preceding.

2. Which of our sovereigns have been deposed? In each case give the date with a brief statement of the causes.

The following sovereigns have been deposed:—*Edward II.*, 1327, for bad government and silly favouritism; *Richard II.*, 1399, by his cousin Henry Bolingbroke, son of John of Gaunt; *Henry VI.*, 1461, by Edward, Duke of York; *Edward V.*, 1483, by his uncle Richard, Duke of Gloucester; *James II.*, 1688, by the Convention Parliament called by William, Prince of Orange.

3. How long has England been at peace with France? Compare the condition of the people now and at the close of the last French war.

England has been at peace with France since the Treaty of Paris (1815).

At the close of the war the English people were left in a feverish and broken condition, both socially and financially. Taxation was so heavy that it could scarcely be borne; many were actually in a state of starvation; bread and other riots were common; and men begged to be sent to the colonies to escape from beggary. Education was almost neglected; there was little or no care concerning the sanitary condition of dwelling-houses, and prisons were dens of pestilence. The tenant was burdened with a rent that he could not pay, and the landlord got laws made to suit himself—for Parliament did not represent the people of England. There were no daily papers by which people could ventilate their grievances, and the governing class obstinately repelled any attempts by the people to share in the government. Hanging was the usual punishment for even petty crimes. Travelling was dear, and only possible for the wealthy; while the postal system was totally inadequate to meet the wants of the people. There was no free trade, and food was miserably insufficient.

Now all these grievances have been removed, and the reign of Queen Victoria will probably be for ever renowned as the epoch, during which changes unequalled in their grandeur and beneficence passed upon the condition of the British people.

Teaching.

Write out notes of a lesson on *The Suez Canal.*

Show a map of the Eastern Hemisphere, or sketch on Blackboard a map of the Canal and Isthmus.

WHERE IT IS.—Joins Mediterranean to Red Sea, extending from Port Said to Suez, thus separating Asia from Africa.

DIMENSIONS.—It is 100 miles long, 327 feet wide at top, 72 feet at bottom, and 26 feet deep. For the last 20 miles it is 196 feet wide; sides slope to prevent washing away.

DESCRIPTION.—Beginning at Port Said—a new town with immense harbour; crosses Lake Menzaleh, a swamp; passes through Kantara cutting; Lake Ballah, a salt marsh; through a cutting of hard sandstone; through Lake Temsah; and reaches the town of Ismailia, a most remarkable town; then through a cutting of 9 miles to the Bitter Lake, once a salt depression, but now filled with sea-water from Mediterranean and Red Seas. From this the Canal is carried 17 miles through dry land to Suez, where the necessary piers, docks, quays, etc., are situated.

The Sweet-water Canal brings fresh water from the Nile to Ismailia, Suez, and by iron pipes to Port Said.

USES.—Shortens the distance to India from Western Europe by making the journey 7600 miles instead of 11,400, and a steamboat voyage is diminished by 30 days, by avoiding the long journey round the Cape of Good Hope. (*Show on map how the route from Britain to India, China, and Australia is shortened.*) Facilitates the rapid transmission of coffee, cotton, indigo, rice, opium, silk, and tea. (*Refer to its seizure by Britain in the last Egyptian war, and the use of the contemplated second canal parallel with the present one.*)

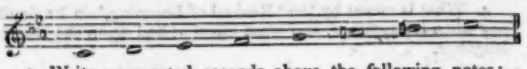
NOTES.—Napoleon Bonaparte suggested the advisability of making a canal across the Isthmus, but as there were only sailing-vessels in his time, and as the navigation of the Red Sea was of too dangerous a character for the proper management of these, it was not till the invention of steamships that the project began to be seriously entertained. The making of the Canal is due to the genius and perseverance of M. de Lesseps. Begun in 1860, it was successfully completed in 1869. It is of more use to Britain than to any other country in the world.

Music.

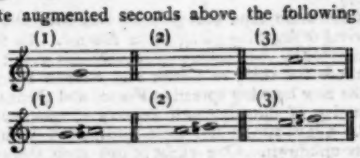
A quarter of an hour allowed for this paper.

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

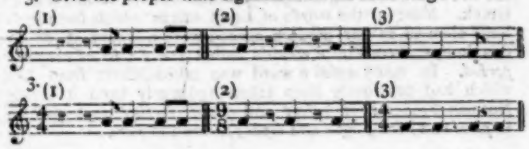
1. Write in the treble clef the signature and ascending scale of C minor, using the major or sharp sixth and the sharp seventh.



2. Write augmented seconds above the following notes:—



3. Give the proper time-signatures to the following:—



TONIC SOL-FA NOTATION.

1. Write (1) above *fah* an augmented second; (2) above *doh* an augmented fifth; (3) above *te* a major third.

1. (1) *Fah* to *se*; (2) *doh* to *se*; (3) *te* to *re*^{1}.

2. Write the minor scale in any one form.

2. *lah*$_1$ *te*$_1$ *doh ray* { *me fah soh lah* / *me fah se lah* / *me ba se lah*

3. Write the following in six-pulse measure by trebling the value of every note:—

|s ,l ,s :s ,f ,r |m :d ‖

2. |s :l :s |s :f :r |m :— :— |d :— :— ‖

ANSWERS TO ARITHMETICAL QUESTIONS IN THE 'LITTLE LEARNER' FOR DECEMBER, 1883.

STANDARD I.

A. (1) 229
(2) 188
(3) 181

B. (1) 436
(2) 2,790
(3) 1,762

C. (1) 1,303
(2) 1,654
(3) 3,014

D. (1) 341
(2) 530
(3) 544

E. (1) 476
(2) 183
(3) 52

F. (1) 73
(2) 149
(3) 279

G. (1) 9,219
(2) 27,968
(3) 16,323

H. (1) 2,493
(2) 822
(3) 885

I. (1) 28,123,236
(2) 72 pounds
(3) 44 sheep

J. (1) 3,020,354,525
(2) 294
(3) 6 marbles

STANDARD II.

A. (1) 84,314
(2) 86,947
(3) 377,760

B. (1) 33,409
(2) 3,581
(3) 55

C. (1) 316,216
(2) 6,693,390
(3) 45,578,400

D. (1) 11,757,900
(2) 3,652,802
(3) 54,929,480

E. (1) 65,377,423
(2) 673,507,850
(3) 2,326,377,240

F. (1) 15,776
(2) 13,836
(3) 2,942

G. (1) 8,228+4
(2) 8,937
(3) 3,391+1

H. (1) 9,452+15
(2) 632+540
(3) 6,879

I. (1) 153 pence; 28s. 9d.
(2) 355 nuts
(3) 8,289 weeks

J. (1) 1,070 legs
(2) 14,443
(3) 120

STANDARD III.

A. (1) 2,376
(2) 1,904
(3) 1,927+39
B. (1) 4,758+6
(2) 8,960
(3) 5,813+35
C. (1) 9,561+213
(2) 9,007
(3) 8,446+88
D. (1) 4,613+3,115
(2) 8,057
(3) 11,519+491
E. (1) £30 13s. 10d.
(2) £256 1s. 5½d.
(3) £412 6s. 9⅞d.
F. (1) £5,465 5s. 3¼d.
(2) £13,386 18s. 3½d.
(3) £52,530 1s. 10¾d.
G. (1) £219 6s. 6d.
(2) £608 16s. 10½d.
(3) £238 16s. 11½d.
H. (1) £64 16s. 8¼d.
(2) £1,445 18s. 10⅜d.
(3) £48,963 17s. 10½d.
I. (1) 8,049 parcels
(2) £24 12s. 3d.
(3) £9 16s. 5d.
J. (1) 1s. 8d.
(2) 70,065
(3) £538 1s. 4d.

ANSWERS TO ARITHMETICAL QUESTIONS IN 'THE SCHOLAR,' FOR DEC., 1883.

STANDARD IV.

A. 1. £1923 11s. 9½d.
2. £315 3s. 2d.
3. 205,920 in.
B. 1. £7129 15s. 3d.
2. £115 8s. 9½d. – 311.
3. 3644 sq. yd. 6 ft. 31 in.
C. 1. 29,760 sec.
2. 2,423,925 pence.
3. £2652 11s. 9½d.
D. 1. £28 13s. 7½d.
2. 197 ton 2 qr. 3 lb. 3 oz.
3. 146 c. yd. 1 ft. 1235 in.
E. 1. 22,809,600 sec.
2. £1 15s. 11¾d.
3. 2½d.—29,195 rem.
F. 1. 124 times.
2. 1441 times, and 56⅔ lbs. left.
3. 1404 bricks.

Advanced Examination.

1. £19 gain.
2. 5 ml. 125 yd.
3. 17s. 9d.

STANDARD V.

A. 1. £3572 3s. 11½d.
2. £8073 12s. 1⅔d.
3. £27 9s. 9½d.
B. 1. £300,537 5s. 9d.
2. £11 0s. 10⅔d.
3. £38 13s. $1\frac{5}{16}$d.
C. 1. £5 6s. 9½d.
2. £46 4s. 0½d.
3. £624 16s. 9½d.
D. 1. £2 14s. 3⅜d.
2. 20 ton.
3. £7 17s. 6d.
E. 1. $2\frac{3}{4}$.
2. $\frac{1}{12}$.
3. $2\frac{2}{3}$.
F. 1. ⅓ the pie left.
2. £7 18s. $9\frac{19}{455}$d.
3. 5 miles.

Advanced Examination.

1. 180.
2. 9s.
3. £105 16s. 1½d.

STANDARD VI.

A. 1. $\frac{5}{8}$.
2. $\frac{5}{12}$.
3. $\frac{7}{11}\frac{0}{2}\frac{8}{5}$.
B. 1. 119·46875.
2. 7s. $7\frac{3}{11}$d.
3. 4·4182+tons.
C. 1. $842\frac{5}{16}$ yds.
2. 4s. 5¼d.
3. £6 11s. 3d.
D. 1. 45 days.
2. $6\frac{2}{3}$ ft. high.
3. $53\frac{1}{3}$ days.
E. 1. £37 13s.
2. £92 8s. 9d.
3. 4½ per cent.
F. 1. ·198875 dec. of 120 yds.
2. $\frac{10\frac{1}{2}}{16}$.
3. 128 to 75.

Advanced Examination.

1. 11½ hours.
2. £2 6s. 10·2708d.
3. 2384 to 1125.

STANDARD VII.

A. 1. 3s. 11·565d.
2. $3\frac{1}{8}$ per cent.
3. $4\frac{5}{16}$d.
B. 1. £146 17s. 6d.
2. £16 11s. 8½d.
3. $116\frac{2}{3}$ per cent.
C. 1. £27 2s. $2\frac{611}{1461}$d.
2. 3s. $2\frac{1}{11}$d.
3. £907 0s. $7\frac{11}{117}$d.
D. 1. $36\frac{1}{2}$ p. c. gain.
2. $18\frac{1}{3}$.
3. 7s. 6d.
E. 1. £80,000.
2. 87 lb.
3. $4\frac{5}{16}$ per cent.
F. 1. $4\frac{1}{2}$.
2. 10,800.
3. £23 12s. $6\frac{7}{11}$d.

Advanced Examination.

1. 108,108; and 35·135 per cent.
2. £148 5s. $6\frac{1}{10}\frac{7}{7}$d.
3. 5 p. cts. at $127\frac{1}{2}$; £784 6s. $3\frac{5}{17}$d.

SOLUTIONS OF THE ADVANCED EXAMINATION QUESTIONS IN 'THE SCHOLAR' FOR DECEMBER, 1883.

STANDARD IV.

1. 3 ton 15 cwt. = 75 cwt. = 8400 lb., × 7 = 58,800 pears; which, divided by 5, gives 11,760 pennyworth = £49 selling price. Then £49 – £30 = £19 gain. Ans.

2. From 11.20 a.m. to 1.40 p.m. = 2 h. 20 m. = 140 m., and $25\frac{1}{2}$ in. × 90 × 140 = 321,300 inches = 5 ml. 125 yd. Ans.

3. 3s. 9d. = 45d. = $4\frac{1}{2}$ tenpences; hence a man earns $4\frac{1}{2}$ times as much as a boy. Then (£3 19s. 10½d. ÷ $4\frac{1}{2}$) = (£7 19s. 9d. ÷ 9) = 17s. 9d. Ans.

STANDARD V.

1. $\frac{1}{3}+\frac{1}{5}+\frac{1}{7}=\frac{71}{105}$; therefore $\frac{71}{105}$ of the number = 141, and 141 ÷ 47 = 3, which is *one* sixtieth. Then 3 × 60 = 180. Ans.

2. 1s. 3d. × 9 = 11s. 3d. value of 9 rabbits or 4 hares.
11s. 3d. × 4 = 45s. 0d. ,, 16 hares or 5 geese.
45s. ÷ 5 = 9s. ,, 1 goose. Ans.

3.

				£	s.	d.
360 tins of beef, each 4 lb., at 4½d. a lb.			=	27	0	0
420	,, mutton	,, 6 ,,	,, 5½d. ,,	=	55	2	6
180	,, rabbit	,, 2 ,,	,, 5⅜d. ,,	=	8	12	6
300	,, hare	,, 4 ,,	,, 7⅓d. ,,	=	37	10	0
					128	5	0
Less 3s. 6d. in the £ discount =					22	8	10½
Ans.				£105	16	1½	

STANDARD VI.

1. The question simplified reads:—If 80 men dig 960 yds. in 25 days of 9 hours each, how many hours a day must 90 men work to dig 800 yds. in 15 days?
Then by proportion and cancelling,—

$$\frac{9 \text{ hr.} \times 5\cancel{8}\cancel{0} \times 8\cancel{0} \times 1\cancel{5}}{6\cancel{0}\cancel{0} \times 9\cancel{0} \times 1\cancel{5}\cancel{3}} = \frac{1\,0\,0}{1\,5} = 11\tfrac{1}{3} \text{ hr. Ans.}$$

2.

Monday's earnings		10s.
Tuesday's	,,	10s. × ·9 = 9s.
Wednesday's	,,	9s. × ·9 = 8·1s.
Thursday's	,,	8·1s. × ·9 = 7·29s.
Friday's	,,	72·9s. × ·9 = 6·561s.
Saturday's	,,	6·561s. × ·9 = 5·9049s.
Ans.		£2 6s. 10·2708d. = 46·8559s. total.

3. 6d. ÷ 3·15 = $1\frac{11}{21}$d. an oz. = $30\frac{1}{3}\frac{5}{2}$d. a lb. for the tea.
£50 ÷ (7·45 × 112) = $14\frac{3}{1}\frac{0}{0}\frac{0}{4}\frac{0}{8}$d. ,, ,, coffee.
Hence the ratio is $30\frac{1}{3}\frac{5}{2}$ to $14\frac{3}{1}\frac{0}{0}\frac{0}{4}\frac{0}{8}=\frac{4}{1}\frac{8}{3}$ to $\frac{1}{1}\frac{2}{0}\frac{0}{0}\frac{0}{0}\frac{0}{0}=95,360$ to 45,000 = 2384 to 1125. Ans.

STANDARD VII.

1.	$12\frac{1}{2}$ per cent. is ⅛	80,000 population in 1841		
		10,000		
	10 ,,	⅒	90,000	,, ,, 1851
			9,000	
	5 ,,	1/20	99,000	,, ,, 1861
			4,950	
	4 ,,	1/25	103,950	,, ,, 1871
			4,158	
	Ans.		108,108	,, ,, 1881

Again,—108,108 – 80,000 = 28,108 increase on the 80,000, or 800 *hundreds*; and 108,108 ÷ 800 = 35·135 per cent. Ans.

2. From June 3rd to September 17th is 106 days; and $\frac{1}{3}\frac{1}{6}\frac{1}{5}$ of £4 = $£1\frac{3}{3}\frac{5}{6}\frac{5}{5}$, hence £100 would amount to $£101\frac{3}{3}\frac{5}{6}\frac{5}{5}$ in the period. Then $\frac{100}{101\frac{35}{365}} = \frac{3\,6\,5\,0\,0}{3\,6\,8\,6\,0} = \frac{1\,8\,2\,5}{1\,8\,4\,3}$ expresses the fraction that the P. W. is of the £150; and $\frac{1\,8\,2\,5}{1\,8\,4\,3}$ of £150 = £148 5s. $6\frac{1}{1}\frac{7}{8}\frac{7}{4}$d. Ans.

3. £92 ÷ 3 = £30⅔; £112 ÷ 4 = £28; £120 ÷ $4\frac{1}{2}$ = £26⅔; and £127½ ÷ 5 = £25½. These several results express the *principal* required to make *one pound* interest in each; consequently, as the 5 per cents. make £1 with the *least* principal, it must be the best investment. 5 per. cents. Ans.

Again,—£20,000 ÷ 127½ = $156\frac{1}{1}\frac{1}{7}$ *hundreds* of stock bought, and £5 × $156\frac{1}{1}\frac{1}{7}$ = £784 6s. $3\frac{5}{1}\frac{5}{7}$d. Ans.

Model Time-Table on the Synchronous Principle, for a School of 60 in average.

STAFF—MASTER, MISTRESS, AND SEWING MISTRESS.

TIME.	Class 1. Sts. IV.-VII.	Class 2. Sts. II. & III.	Class 3. Standard I.	Class 4. Infants.
A.M.				
9—9.10	Assembly and Prayers.			
9.10—9.45	Religious Instruction :— Old Testament, **M. W.** New Testament, **T. Th.** Catechism or Texts, **F.**			
9.45—9.55	Registers marked.			
9.55—10.35	Arithmetic.			
10.35—10.45	Recreation.			
10.45—11.30	Reading and Spelling.			Reading.
11.30—12	Writing :— Copy Books, **T. Th.** Dictation or Composition, **M. W. F.**			Writing.
12—12.5	Grace and Dismissal.			
P.M.				
2—2.5	Assembly and Grace			
2.5—2.15	Registers marked.			
2.15—2.50	Arithmetic, **M. W. Th.** Dictation or Composition, **T. F.**			Arithmetic.
2.50—3.30	Reading, **T. Th.** English, **M. W. F.**			Reading.
	Standard I. Reading, **M. T. W. Th.**			
	„ English, **F.** only.			
3.30—3.40	Recreation.			
3.40—4.15	Geography, **M. W. F.** Singing, **M. Th.**			Object Lesson (Infts.) **M. W. F.**
4.15—4.30	Home Lessons examined and set. Tables and Mental Arithmetic. Girls' Needlework, Tuesday and Thursday.			

NOTES.

A Time-table on the Synchronous Principle provides for each class taking the same subject at the same time, and thus enables the principal teacher to concentrate his attention on one subject at a time. It seems especially applicable to small schools where the head-teacher must take each class, but it may be used with advantage in large schools, as it has the great merit of simplicity, and can be well employed in the latter with sufficient class-room accommodation. In a small school the Master or Mistress would spend a part of each lesson with each class, *e.g.*, in Reading, while Standards II., III., IV., V., VI. were looking over their lesson, the Master would be reading over a chapter with Standard I., explaining difficult words, and letting the class read after him simultaneously. After giving them a little individual practice, he would pass on to another class, leaving a monitor to hear Standard I. in the way shown by the Master.

In Arithmetic, the Master would explain a rule, and illustrate it on the Blackboard to one class, while the other classes were working examples. He could take two or three classes in this way in each lesson, and also look round the work of each class as marked by monitors, towards the close of the lesson.

Sufficient lessons in Reading are provided to enable three sets of books to be gone through in Standards III.—VII.

In English, the Master would take one class in Oral teaching in Grammar or repetition, while the other classes were learning Grammar from a text-book previously fully explained and illustrated by the Master, or parsing, or learning poetry.

In Geography, while one class was being taught or examined by the Master, the other classes would be getting up the facts from a chapter in the Geography Readers previously explained, finding the places in atlases, and drawing maps, being examined and taught by the Master in their turn.

The Infants would be taken by the monitress mostly in the class-room, but the Master would occasionally be able to let her supervise the Standards in silent work, while he was teaching the Infants.

SUMMARY.	LESSONS.
Religious Instruction	5
Arithmetic	8
Reading (Standards II.—VI.)	7
Writing (Standards)	2
„ (Infants)	5
Reading (Infants)	10
Arithmetic „	10
Dictation (or Composition for V. and VI.)	5
Grammar or English	3
English (Standard I.)	1
Reading (Standard I.)	9
Geography	3
Singing	2
Object Lesson, Form and Colour, etc., Infants	3

Query Column.

RULES.

1. Each correspondent is restricted to *one question.* We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ **When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.**

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher, Pilgrim Street, Ludgate Hill, London, E.C.*

Arithmetic.

1. A. C. A.—A lb. of tea and four lbs. of sugar cost 5s.; but if sugar were to rise 50 per cent., and tea 10 per cent., they would cost 6s. 2d. Required the prices of tea and sugar per lb. (*Colenso.*)

Cost of 1 lb. of tea + cost of 4 lbs. of sugar = 5s.;
Cost of 1 lb. of tea at 10 % increase + cost of 4 lbs. of sugar at 50 % increase = 6s. 2d.,
Cost of 1 lb. of tea at $\frac{11}{10}$ of original price + cost of 4 lbs. of sugar at $\frac{3}{2}$ of original price = 6s. 2d.,
Cost of 1 lb. of tea at original price + cost of 4 lbs. of sugar at $\left(\frac{3}{2}\times\frac{10}{11}\right)$ of original price = 6s. 2d. $\times\frac{10}{11}$,

Cost of 1 lb. of tea at original price + cost of $(4\times\frac{15}{11})$ lbs. of sugar at original price = $\frac{60}{11}$d.,
Cost of 1 lb. of tea + cost of $\frac{60}{11}$ lbs. of sugar = $\frac{60}{11}$d.,
But, " " " + " 4 " " = 5s.,
∴ (By subtraction),

Cost of $(\frac{60}{11}-4)$ lbs. of sugar = $(\frac{60}{11}-60)$d.
Cost of $\frac{16}{11}$ lbs. of sugar = $\frac{16}{11}$d.

∴ Cost of 1 lb. of sugar = $\left(\frac{80}{11}\times\frac{11}{16}\right)$d. $= \underline{5}$d.

Cost of 1 lb. of tea = 5s. − (5d. × 4)
= 3s. 4d.

2. SOLICITOR.—A person held £3,559 10s. railway stock, having bought in at 117½; he received the half-year's dividend at the rate of 5½ per cent. per annum, and then sold out at 119½. How much money has he made? (*Brook Smith.*)

£	s.
3559	10
	5½
17797	10
1779	15
£195'77	5
	20
s. 15'45	
	12
d. 5'40	

Dividend = ½ of £195 15s. 5⅖d.
= £97 17s. 8$\frac{7}{10}$d.

£	£	£	
		119½	
		117½	
100	3559½ ::	1⅞	: Profit on sale.
16	2	8	
1600	7119	13	
	13		
16,00	925,47		
	£57 16s. 10$\frac{7}{10}$d.		

∴ Total profit = £97 17s. 8$\frac{7}{10}$d. + £57 16s. 10$\frac{7}{10}$d.
= £155 14s. 6⅖d. Ans.

3. ANXIOUS.—If the gold of which a cup is made contains 10 per cent. alloy, what will be the quantity of pure metal in the cup, if it weigh 1 lb. 7 oz. 13 dwts. 13 grs.? (*Scholarship, 1883*)

Quantity of pure metal = $\frac{9}{10}$ of 1 lb. 7 oz. 13 dwts. 13 grs.
= 1 lb. 7 oz. 13 dwts. 13 grs. −
1 oz. 19 dwts. 8½ grs.
= 1 lb. 5 oz. 14 dwts. 4½ grs. Ans.

4. CORRESPONDENT.—An old gentleman left his godchild a box, containing sovereigns and shillings; the sovereigns were worth as many times the shillings, as the shillings were worth the box; the value of the box was 2s. 6d., and there were 5832 sovereigns in the box. How many shillings were there? (*Barnard Smith.*)

$$\frac{\text{Value of shillings}}{\text{Value of box}} = \frac{\text{Value of sovereigns}}{\text{Value of shillings}}$$

$$\frac{\text{Value of shillings}}{\text{2s. 6d.}} = \frac{\text{£5832}}{\text{Value of shillings}}$$

$$\frac{\text{No. of shillings}}{2\frac{1}{2}} = \frac{5832\times 20}{\text{No. of shillings}}$$

No. of shillings × No. of shillings = 116,640 × ⅖
= 291,600
∴ No. of shillings = $\sqrt{291,600}$
= 540. Ans.

5. SON DHU.—The sum of two numbers is 1878, and their product is 880,821. Find the two numbers. (To be solved by arithmetic.) (*Cassell's* 'Saturday Journal.')

(1878)² = 3,526,884
(880,281) × 4 = 3,523,284
3,600

Difference of the two Nos. = $\sqrt{3600}$
= 60;
∴ Larger No. = (1878 + 60) ÷ 2
= 1938 ÷ 2
= 969;
Smaller No. = 1878 − 969
= 909.

Note.—If your writing were devoid of flourishes, we believe it would obtain full marks at the Scholarship Examination.

6. D'A.—Find to three places of decimals the number of metres in length of English silk ⅔ yd. wide, worth 2s. 6d. per sq. ft., which must be given for 10 metres in length of French velvet ½ metre wide, worth £1 per sq. metre, if 37 English ft. be equal to 36 Rhenish ft., 3·192 of which latter are equal in length to one metre.

Value of French velvet = $(10\times\frac{1}{2})$£
= $\frac{10}{2}$£;
Quantity of English silk = (£$\frac{10}{2}$ ÷ 2s. 6d.) sq. ft.
= $(\frac{10}{2}\times 8)$ sq. ft.
= $\frac{80}{2}$ sq. ft.;
∴ Length " " = $\frac{80}{2}$ sq. ft. ÷ $\frac{2}{3}$ yd.
= $(\frac{120}{2}\times\frac{1}{3})$ ft.
= $\frac{120}{6}$ ft.

$$= \frac{160}{\frac{\cancel{22}}{\cancel{7}} \times \frac{\cancel{4}}{\cancel{88}} \times \cancel{37} \times \frac{\cancel{3}\cdot\cancel{192}}{\cancel{3}}} \text{ metres}$$

$$= \frac{160}{44\cdot289} \text{ metres}$$

$$= 3\cdot612\ldots\text{metres.} \quad \text{Ans.}$$

7. DENNY, Leamington.—Two boats pass the lower end of a gang of barges at an interval of 2 minutes, and the upper end at an interval of $1\frac{1}{2}$ minutes, going up stream with given velocities v_1 and v_2. How soon will the boats be together, assuming (1) that the barges are anchored, (2) that they are floating down stream with a velocity of 1 mile per hour? (*Hamblin Smith.*)

(1) Distance between the boats when 1st passes lower end of barges $= (v_2 \times \frac{2}{60})$ miles

$$= \frac{v_2}{30} \text{ miles};$$

Distance gained in 1 hr. $= (v_2 - v_1)$ miles;

∴ Time from 1st boat passing lower end of barges

$$= \left\{ \frac{v_2}{30} \text{miles} \div (v_2 - v_1) \text{ miles} \right\} \text{hrs.}$$

$$= \frac{v_2}{30(v_2 - v_1)} \text{ hrs.} \quad \text{Ans.}$$

(2) Distance floated by barges in 2 minutes

$$= 1 \text{ mile} \times \frac{2}{60} = \frac{1}{30} \text{ mile};$$

∴ Distance between the boats when 1st passes lower end of barges

$$= \left(\frac{v_2}{30} + \frac{1}{30} \right) \text{miles}$$

$$= \left(\frac{v_2 + 1}{30} \right) \text{miles};$$

∴ Time from 1st boat passing lower end of barges

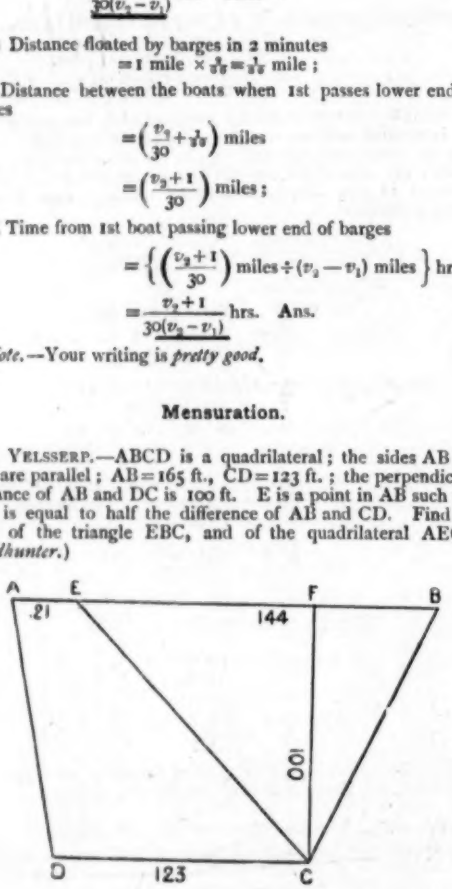
$$= \left\{ \left(\frac{v_2 + 1}{30} \right) \text{miles} \div (v_2 - v_1) \text{ miles} \right\} \text{hrs.}$$

$$= \frac{v_2 + 1}{30(v_2 - v_1)} \text{ hrs.} \quad \text{Ans.}$$

Note.—Your writing is *pretty good*.

Mensuration.

1. YELSSERP.—ABCD is a quadrilateral; the sides AB and DC are parallel; AB = 165 ft., CD = 123 ft.; the perpendicular distance of AB and DC is 100 ft. E is a point in AB such that AE is equal to half the difference of AB and CD. Find the area of the triangle EBC, and of the quadrilateral AECD. (*Todhunter.*)



$$AE = \frac{165 - 123}{2} \text{ ft.} = 21 \text{ ft.}; \quad EB = (165 - 21) \text{ ft.} = 144 \text{ ft.}$$

$$\text{Area of triangle EBC} = \frac{EB \times CF}{2}$$

$$= \frac{144 \times 100}{2} \text{ sq. ft.}$$

$$= 7,200 \text{ sq. ft.}$$

$$\text{Area of quadrilateral AECD} = \frac{AE + DC}{2} \times CF$$

$$= \left(\frac{21 + 123}{2} \times 100 \right) \text{sq. ft.}$$

$$= 7,200 \text{ sq. ft.}$$

2. RALPHO.—The extremity of the minute hand of a clock moves 5 inches in $3\frac{1}{2}$ minutes. What is its length?

$$\text{Circumference traced out by minute hand} = \left(5 \times \frac{60}{3\frac{1}{2}} \right) \text{in.}$$

$$= 1\frac{\cancel{43}\,\cancel{8}}{\cancel{77}\,\cancel{11}} \text{ in.};$$

$$\therefore \text{Length of minute hand} = \{(1\tfrac{\cancel{43}\,\cancel{8}}{\cancel{77}\,\cancel{11}} \div 3\cdot1416) \div 2\} \text{ in.}$$

$$= (1\tfrac{\cancel{43}\,\cancel{8}}{\cancel{77}\,\cancel{11}} \div 6\cdot2832) \text{ in.}$$

$$= (92\cdot307692 \div 6\cdot2832) \text{ in.}$$

$$= 14\cdot69\ldots\text{in.} \quad \text{Ans.}$$

3. T.T.B.—What is the cost of digging a trench 4 ft. deep, 6 ft. wide at the bottom, 8 ft. at the top, and 50 ft. long, and of wheeling all the materials to one end? The price of digging is 5d. per cubic yard, and the price of wheeling 2d. per run of 20 yards. (*Evers.*)

$$\text{Content of trench} = (50 \times \frac{8+6}{2} \times 4) \text{ cub. ft.}$$

$$= (200 \times 7) \text{ cub. ft.}$$

$$= 1\tfrac{\cancel{400}}{\cancel{27}} \text{ cub. yds.};$$

$$\therefore \text{Cost of digging} = (1\tfrac{\cancel{400}}{\cancel{27}} \times 5) \text{ d.}$$

$$= 7\tfrac{\cancel{2000}}{\cancel{27}} \text{ d.}$$

$$= 259\tfrac{7}{27} \text{ d.}$$

$$= £1 \text{ 1s. } 7\tfrac{7}{27}\text{d.}$$

$$\text{No. of runs} = 1\tfrac{\cancel{400}}{\cancel{27}} \times \frac{(50 \text{ ft.} \div 40 \text{ yds.})}{\cancel{20}}$$

$$= \frac{\cancel{140}\cancel{0}}{27} \times \frac{5}{\cancel{20}}$$

$$= 1\tfrac{\cancel{70}}{\cancel{27}};$$

$$\therefore \text{Cost of wheeling} = (1\tfrac{\cancel{70}}{\cancel{27}} \times 2) \text{ d.}$$

$$= 2\tfrac{\cancel{40}}{\cancel{27}} \text{d.}$$

$$= 43\tfrac{\cancel{7}}{\cancel{27}}\text{d.}$$

$$= 3\text{s. } 7\tfrac{\cancel{7}}{\cancel{27}}\text{d.}$$

4. LEO.—A gold wire ·01 of an inch in thickness is bent into a ring of one inch internal diameter; if the area enclosed by the ring be gilded with a weight of gold equal to the weight of the ring, find the thickness of the gilding. (*Todhunter.*)

$$\text{Solidity of ring} = (\cdot01^2 \times \cdot7854 \times \{1 + (\cdot01 \times 2)\} \times 3\cdot1416) \text{ c. in.}$$

$$= (\cdot0001 \times \cdot7854 \times 1\cdot02 \times 3\cdot1416) \text{ cub. in.}$$

$$\text{Area of enclosed space} = (1^2 \times \cdot7854) \text{ sq. in.}$$

$$= \cdot7854 \text{ sq. in.};$$

$$\therefore \text{Thickness of gilding} = \frac{\cdot0001 \times \cancel{\cdot7854} \times 1\cdot02 \times 3\cdot1416}{\cancel{\cdot7854}} \text{ in.}$$

$$= \cdot0003204432 \text{ in.} \quad \text{Ans.}$$

5. A.B.C.—The difference between the diameter and the circumference of a circle is 10 feet; find the diameter. (*Todhunter.*)

Circumference = Diameter × 3·14159;

When the diameter is 1 ft., the circumference is 3·14159 ft.;

∴ When the diameter is 1 ft., the difference between the circumference and the diameter is 2·14159 ft.;

$$\therefore \text{Diameter} = \frac{10}{2\cdot14159} \text{ ft.}$$

$$= 4\cdot669\ldots\text{ft.} \quad \text{Ans.}$$

6. P. T.—A rectangular park, one side of which is twice as long as the other, contains 500 acres; how much ground will be occupied by a road 15 feet wide running round it?—(*Moffatt's Pupil Teacher's Course.*)

Area of park = length × breadth

= twice breadth × breadth

= breadth² × 2;

∴ breadth² × 2 = 500 acres

= (500 × 4840) sq. yds.

Breadth² = (500 × 2420) sq. yds.

= 1,210,000 sq. yds.

∴ breadth = $\sqrt{1,210,000}$ sq. yds.

= 1100 yds.;

And length = 2200 yds.

Area of road = {2200 yds. + (15 ft. × 2) + 1100 yds.} × 15 ft. × 2

= 3310 yds. × 10 yds.

= 33,100 sq. yds. Ans.

7. MENSURO.—The sides of a triangle are 68, 75, and 77; a straight line is drawn across the triangle parallel to the longest side, and dividing each of the other two sides into equal parts: find the area of the two parts into which the triangle is divided. (*Todhunter.*)

$(68+75+77)\div 2=110$; $110-68=42$; $110-75=35$; $110-77=33$.

$$\text{Area of triangle} = \sqrt{110\times 42\times 35\times 33}$$
$$= \sqrt{11\times 2\times 5\times 7\times 2\times 3\times 7\times 5\times 11\times 3}$$
$$= \sqrt{11^2\times 2^2\times 5^2\times 7^2\times 3^2}$$
$$= 11\times 2\times 5\times 7\times 3$$
$$= 2{,}310.$$

Similar triangles are to one another as the squares of their homologous sides.

$\therefore$ Area of upper part $= (\frac{1}{2})^2$ of 2,310
$= \frac{1}{4}$ of 2,310
$= 577\frac{1}{2}$;
„ „ lower „ $= 2{,}310 - 577\frac{1}{2}$
$= 1{,}732\frac{1}{2}$.

Todhunter's 'Mensuration.' We know of no key. *Dr. Morris's* or *Canon Daniel's* 'Grammar.'

General.

1. ALTARNUM.—*Findlater's* 'Advanced Physiography,' or *Huxley's* 'Physiography.'

2. HIERO.—'The Hieron of Xenophon' is published by Macmillan, 3s. 6d.

3. DUNELM.—The country was made up of counties and not divided into counties, as is usually stated. Similarly a county is an aggregate of hundreds, tithings, etc., which in some cases were not originally compact. Worcester in England, and Cromarty in Scotland are notable instances of distribution.

4. NESTA.—You will find the solution of your query in our issue for April, 1882.

5. WELLINGTON.—The answer in the book is evidently wrong.

6. VERAX.—The solution of your query appeared in our issue for April, 1882.

7. WESLEYAN should write to Westminster for terms of admission. The Q. S. Examination will be held during the second week in July, 1884. If he is not a P.T. he should study the P.T.'s schedule: there is no other syllabus. Enquire of Moffatt and Paige for Solutions to Q.S. questions. Writing is good.

8. M. N. A.—The geometry may be 'wrought out' in pencil at the May Examination.

9. RALPHO'S 'rapid' writing is better: if the looped letters were of uniform height it might gain 85 %. Read the 'rest' of Cæsar. You need at present common constructions, not particular styles.

The Scholarship Questions will not be published in the PRACTICAL TEACHER this year.

10. E. D. T.—Monmouth was annexed to England about 350 years ago, when the rest of Wales was divided into twelve counties. 'The English Justinian' was Edward I.

11. X. Y. Z.—Parse the words in italics, and analyse the first and third and fourth stanzas:—

Triumphal arch, *that* fill'st the sky,
When storms prepare to part,
I ask not proud Philosophy
To teach me *what* thou art.

Still *seem*, *as* to my childhood's sight,
A mid-way *station* given
For happy spirits to alight
Betwixt the earth and heaven.

Can all that optics teach, *unfold*
Thy form to please me *so*,
As when I dreamt of gems and gold
Hid in thy radiant brow?

When *Science* from Creation's face
Enchantment's *veil* withdraws,
What lovely visions yield their place
To cold material laws!

That—rel. pro., neut., sing., 3rd, nom. to 'fill'st.'
what—comp. rel. pro. = that which, neut., sing., 3rd, *that*—obj. gov. by 'teach,' *which*—nom. after 'art.'
seem—reg. intrans. verb, imp., 2nd, sing. pres., agreeing with its nom., 'thou' und.
station—com. noun, neut., sing., 3rd, nom. after the copulative verb 'seem.'
for—prep., showing relation between 'spirits' and 'given.'
can—aux. verb to 'unfold,' indicating pot. mood, present tense.
all—indef. num. adj., qual. 'things' und.
that—rel. pro., neut. plur., 3rd, obj. gov. by 'teach.'
unfold—verb, reg. trans., act., inf., pres., gov. by 'can.'
can unfold—verb, reg. trans., act., pot., pres., 3rd, plur., agreeing with its nom. 'things' und.
so—adv. of manner, qualifying 'to please.'
hid—past. part. of 'to hide,' referring to 'gems and gold.'
Science—com. noun., neut. sing., 3rd, nom. to 'withdraws.'
veil—com. noun., neut., sing., 3rd, obj. gov. by 'withdraws.'
what—adj. of quality, qual. 'visions.'

SENTENCE.	KIND OF SENT.	CONNECTIVE	SUBJECT.	PREDICATE.	OBJECT.	EXT. OF PRED.
Triumphal arch			*Nominative of address.*			
(*a*) t*h*at fill'st the sky	Adj.	Contd. in rel.	that storms	fill'st	the sky	not (neg.)
(*b*) when storms prepare to part.	Adv. to *a*	when	I	prepare	to part (ind. obj.)	
(*c*) I ask not proud Philosophy to teach me	Princ.			ask	proud Philosophy (dir. obj.) to teach me (ind. obj.)	to please me so (purpose)
(*d*) what thou ar	Adj. to *c*.	Contd. in rel.	thou	art what	thy form	
(*e*) Can all unfold thy form to please me so.	Princ.		all	can unfold	that	
(*f*) that optics teach	Adj. to *all* in *e*.	Contd. in rel.	optics	teach	of gems and gold hid in thy radiant brow (ind. obj.)	
(*g*) as (I was pleased)	Adv. to *e*.	as	(I)	was pleased		
(*h*) when I dreamt of gems and gold.	Adv. to *g*.	when	I	dreamt		
(*i*) When Science from Creation's face enchantment's veil withdraws	Adv. to *j*.	when	science	withdraws	enchantment's veil	from creation's face (place)
(*j*) What lovely visions yield their place to cold material laws.	Princ.		what lovely visions	yield	their place (dir. obj.) to cold material laws (ind. obj.)	

12. EXPRESS, who 'passed in the 4th Division'—we presume he means the 3rd—in 1882, will obtain his *parchment* 'in October, 1884,' if his school then passes a second good examination. It will be sent without 'application.' This need not, however, prevent his attempt to raise his certificate next Christmas, 'two years after his last examination' (Code, Art. 68). He has, of course, complied with Art. 59.

13. JOE.—Your query was solved in our issue for October, 1883.

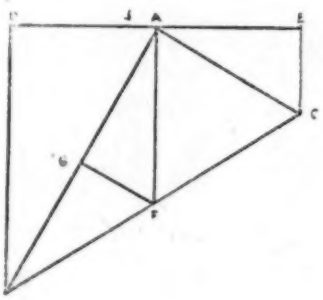
14. A. B. C.—We repeat there is no syllabus but that of the Schedule for P. T.'s in the Code. Langler's 'Geography' contains many definitions. For admission to any training college apply as soon as convenient, but not later than March.

15. J. CRAPAUD.—But this was not all. Contiguous to the garden there was a meadow in which grazed two cows, which not only furnished the family with cream and butter, but which, in addition, gave each morning two basins of milk to the poor families of the neighbourhood. By the side of the meadow were the kitchen-garden and the orchard, in which, during the autumn, ripened in abundance apples of all kinds and of all sizes—from the little red apples which Mr. Dupré sometimes gave to the children when they were good, to the large green apples with which one (they) made delicious pies for the school-feast, which took place each year, and of which I am going (about) to speak to you now.

There were in the village two schools—one for boys and the other for girls—but there was none for little children; for there did not exist then any *salles d'asile* (rooms of refuge or protection: infants' schools or nurseries). . . .

16. FAUST.—(1) The solution of your query appeared in our issue for October, 1882. (2) If your writing were a little larger, it might obtain the full percentage of marks at the Civil Service Examinations.

17. W. S. THOMSON.—A buoy is moored in the middle of a stream by two ropes at right angles fastened to the banks—if the tension of one rope is equal to half the force exerted by the current on the buoy, show that the other rope is equal to the breadth of the stream. (*M. A. Examination, Aberdeen University*, 1883.)



Let A represent the buoy, BA, AC the ropes, and DE the breadth of the stream.

Bisect BC in F, and join AF.

Draw FG perpendicular to AB.

Proof.—The force of the current is represented by twice AF, for if the parallelogram be completed, twice AF would represent the resultant of BA and AC.

But AC is equal to half the force exerted by the current; therefore AC = AF.

Because DE is bisected in A, and BC is bisected in F, therefore AF is parallel to EC.

Angle ACE = angle FAC, (I. 29)
And angle AFG = angle FAC, as FG is parallel to AC,
∴ angle AFG = angle ACE, (Ax. 1.)
And angle AGF = angle AEC, (Ax. 11.)
Also side AF = side AC,
∴ side AG = side AE. (I. 26.)

Now, the middle point of the hypotenuse of a right-angled triangle is equi-distant from the three angles.

∴ FA = FB, and consequently triangle AFB is isosceles;

Wherefore, perpendicular FG bisects base AB.

But AG = AE, that is, half the breadth of the stream,

∴ AB = DE, that is, the breadth of the stream.

18. WEG.—(1) *Todhunter's* 'Algebra for Colleges and Schools.' (2) *Potts's* 'Euclid.' (3) *Todhunter's* 'Plane Trigonometry.' (4) *Chambers's* 'Mathematical Tables.'

19. PHI.—The solution of your query appeared in our issue for December, 1882.

20. M. H.—We cannot reply to anonymous queries.

21. STUDENT should write for information to the Secretary of the Syndicate, Cambridge; and to Macmillan's, Longman's, and Rivingtons' for catalogues. We do not undertake to pronounce an authoritative opinion as to the *best* edition of any classical author.

22. C. K. F.,—It is understood that 'passes' in May are credited to a candidate at the Q. S. Examination in July. It matters not for this purpose who was the teacher.

Algebra.

1. CHOKRA.—A man manufactures pins. He pays in each year a certain sum for rent, insurance, etc., whatever be the number of pins made, 'fixed expenses;' a certain sum per gross of pins in wages, and a certain sum per gross for materials. In a certain year he made and sold £10,000 worth of pins, clearing thereby £2000 profit. He calculated that if the rate of wages had been 50 per cent. higher, and the price of materials 16⅔ per cent. higher, but he had sold twice as many pins at the same price, the profit would still have been £2000; whereas, if he had sold half as many pins at 50 per cent. higher price (viz., for £7500), with the above-named increased rates for wages and material, his profit would have been but £1500. What did he pay for fixed expenses, wages, and material in that year?—(*Matriculation*, 1881.)

Let x, y, z = amounts in pounds for fixed expenses, wages, and material respectively;

Then (1) $10{,}000-(x+y+z)=2000$

(2) $20{,}000-\left\{x+2\left(\frac{3y}{2}+\frac{7z}{6}\right)\right\}=2000$

(3) $7{,}500-\left\{x+\frac{1}{2}\left(\frac{3y}{2}+\frac{7z}{6}\right)\right\}=1500$

(1) $x+y+z=8000$

(2) $x+3y+\frac{7z}{3}=18{,}000$

(3) $x+\frac{3y}{4}+\frac{7z}{12}=6000$

(1) $x+y+z=8000$
(2) $3x+9y+7z=54{,}000$
(3) $12x+9y+7z=72{,}000$

(3) $12x+9y+7z=72{,}000$
(2) $3x+9y+7z=54{,}000$
$9x=18{,}000$
$\therefore x=2000.$

(1) $y+z=6000$
(2) $9y+7z=48{,}000$

(1) $7y+7z=42{,}000$
(2) $9y+7z=48{,}000$
$2y=6000$
$\therefore y=3000.$

(1) $y+z=6000$
$\therefore z=3000.$

$\therefore$ Fixed expenses = £2000
Wages = £3000
Material = £3000 } Ans.

2. VICTOR.—Simplify—

$$\frac{\pm 3d\sqrt{c}\,(ac^2+bd^2)-2a(ac^2+bd^2)}{(2a+3d\sqrt{c})\,(2a-3d\sqrt{c})}.$$

$$\frac{\pm 3d\sqrt{c}\,(ac^2+bd^2)-2a(ac^2+bd^2)}{(2a+3d\sqrt{c})\,(2a-3d\sqrt{c})}$$

$$=\frac{(3d\sqrt{c}-2a)\,(ac^2+bd^2)}{(2a+3d\sqrt{c})\,(2a+3d\sqrt{c})},\text{ or }\frac{(-3d\sqrt{c}-2a)\,(ac^2+bd^2)}{(2a+3d\sqrt{c})\,(2a-3d\sqrt{c})}$$

$$=\frac{-(2a-3d\sqrt{c})\,(ac^2+bd^2)}{(2a+3d\sqrt{c})\,(2a-3d\sqrt{c})},\text{ or }\frac{-(2a+3d\sqrt{c})\,(ac^2+bd^2)}{(2a+3d\sqrt{c})\,(2a-3d\sqrt{c})}$$

$$=\frac{-ac^2+bd^2}{2a+3d\sqrt{c}},\text{ or }-\frac{ac^2+bd^2}{2a-3d\sqrt{c}}.$$

3. INQUISITIVE.—Solve:—

$$\left.\begin{array}{l} a\,(y+z)=1 \\ b\,(z+x)=1 \\ c\,(x+y)=1 \end{array}\right\}.$$

(Medical Degree Examination, Edinburgh University, 1883-4)

$$\left.\begin{array}{l}(1)\ a(y+z)=1\\(2)\ b(z+x)=1\\(3)\ c(x+y)=1\end{array}\right\}$$

$$\left.\begin{array}{l}(1)\ y+z=\frac{1}{a}\\2)\ x+z=\frac{1}{b}\end{array}\right\}$$

$$\left.\begin{array}{l}x-y=\frac{1}{b}-\frac{1}{a}\\(3)\ x+y=\frac{1}{c}\end{array}\right\}$$

$$2x=\frac{1}{c}+\frac{1}{b}-\frac{1}{a}$$
$$=\frac{ab+ac-bc}{abc}$$
$$\therefore\ x=\frac{ab+ac-bc}{2abc}.$$

$$2y=\frac{1}{c}-\frac{1}{b}+\frac{1}{a}$$
$$=\frac{ab-ac+bc}{abc}$$
$$\therefore\ y=\frac{ab+bc-ac}{2abc}.$$

$$(1)\ z=\frac{1}{a}-\frac{ab+bc-ac}{2abc}$$
$$=\frac{2bc-ab-bc+ac}{2abc}$$
$$=\frac{ac+bc-ab}{2abc}.$$

4. F. WOOD.—The sum of four numbers in arithmetical progression is $19\frac{1}{2}$, and the sum of the products, taken two and two together, is $138\frac{1}{16}$; find the numbers. (*Certificate*, 1881.)

Let a be the first No., and d the difference.

$$\left.\begin{array}{l}\text{Then, (1) } a+(a+d)+(a+2d)+(a+3d)=19\frac{1}{2}\\(2)\ a(a+d)+a(a+2d)+a(a+3d)\\\quad+(a+d)(a+2d)+(a+d)(a+3d)\\\quad+(a+2d)(a+3d)=138\frac{1}{16}\end{array}\right\}$$

$$(1)\ 4a+6d=19\tfrac{1}{2}$$
$$4a=19\tfrac{1}{2}-6d$$
$$\therefore\ a=\frac{39-12d}{8}.$$

$$(2)\ a^2+ad+a^2+2ad+a^2+3ad+$$
$$a^2+3ad+2d^2+a^2+4ad+3d^2+$$
$$a^2+5ad+6d^2=138\tfrac{1}{16}$$
$$6a^2+18ad+11d^2=138\tfrac{1}{16}$$
$$6\left(\frac{39-12d}{8}\right)^2+18d\left(\frac{39-12d}{8}\right)+11d^2=2\tfrac{9}{16}$$
$$6\left(\frac{1521-936d+144d^2}{64}\right)+\frac{702d-216d^2}{8}+11d^2=2\tfrac{9}{16}$$
$$9126-5616d+864d^2+5616d-1728d^2+704d^2=8876$$
$$1568d^2-1728d^2=8876-9126$$
$$-160d^2=-250$$
$$d^2=\tfrac{25}{16}$$
$$\therefore\ d=\tfrac{5}{4}.$$

$$(1)\ a=\frac{39-12d}{8}$$
$$=\frac{39-(\frac{5}{4}\times 12)}{8}$$
$$=\frac{39-15}{8}$$
$$=\tfrac{24}{8}$$
$$=3.$$
$$\therefore\ \text{Nos.}=3,\ 4\tfrac{1}{4},\ 5\tfrac{1}{2},\text{ and } 6\tfrac{3}{4}.$$

5. DISCIPULUS.—A farmer sold 10 sheep at a certain price, and 5 others at 10s. less per head; the sum he received for each lot was expressed in pounds by the same digits, but in one case the order of the digits was the reverse of what it was in the other. Find the price of each sheep. (*Boy's Algebra.*)

Let $10x+y$=price of the 10 sheep in pounds,

Then, $\frac{10x+y}{10}$= „ „ each sheep „ ;

$$\therefore\ 5\left(\frac{10x+y}{10}-\tfrac{1}{2}\right)=10y+x$$
$$\frac{10x+y-5}{2}=10y+x$$
$$10x+y-5=20y+2x$$
$$10x-2x=20y-y+5$$
$$8x=19y+5$$
$$\therefore\ x=\frac{19y+5}{8}.$$

Now, x and y must be single integers, and this occurs only when $y=1$.

$\therefore\ y=1$ and $x=3$.

$\therefore$ Price of the 10 sheep=£1 31,

„ „ each sheep=£3 2s. Ans.

6. TIMIDUS.—Find the G.C.M. and L.C.M. of $a^3+3ab-4b^3$, $2a^2-3ab+b^2$, and $2a^2+7ab-4b^2$. (*Coll. Preceptors, June*, 1882.)

$$a^3+3ab-4b^3=(a+4b)(a-b),$$
$$2a^2-3ab+b^2=(2a-b)(a-b),$$
$$2a^2+7ab-4b^2=(2a-b)(a+4b);$$
$$\therefore \text{G.C.M.}=1.$$
$$\text{L.C.M.}=(a+4b)(a-b)(2a-b)$$
$$=(a^2+3ab-4b^2)(2a-b)$$
$$=2a^3+5a^2b-11ab^2+4b^3.$$

7. ANXIOUS.—Solve :—

$$\left.\begin{array}{l}x+\frac{1}{y}=5\cdot5\\y+\frac{1}{x}=2\cdot2\end{array}\right\}$$

$$\left.\begin{array}{l}x+\frac{1}{y}=5\cdot5\\y+\frac{1}{x}=2\cdot2\end{array}\right\}$$

$$\left.\begin{array}{l}\frac{xy+1}{y}=\frac{11}{2}\\\frac{xy+1}{x}=\frac{11}{5}\end{array}\right\}$$

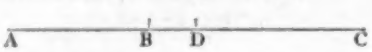
$$\left.\begin{array}{l}xy+1=\frac{11y}{2}\\xy+1=\frac{11x}{5}\end{array}\right\}$$

$$\therefore\ \frac{11y}{2}=\frac{11x}{5}$$
$$\frac{y}{2}=\frac{x}{5}$$
$$\therefore y=\frac{2x}{5}.$$
$$xy+1=\frac{11x}{5}$$
$$\frac{2x^2}{5}+1=\frac{11x}{5}$$
$$2x^2+5=11x$$
$$x^2-\frac{11x}{2}=-\tfrac{5}{2}$$
$$x^2-\frac{11x}{2}+(\tfrac{11}{4})^2=\tfrac{121}{16}-\tfrac{5}{2}$$
$$=\frac{121-40}{10}$$
$$=\tfrac{81}{16}$$
$$x-\tfrac{11}{4}=\pm\tfrac{9}{4}$$
$$x=\pm\tfrac{9}{4}+\tfrac{11}{4}$$
$$\therefore x=5,\text{ or }\tfrac{1}{2}.$$
$$y=\frac{2x}{5}$$
$$\therefore y=2,\text{ or }\tfrac{1}{5}.$$
$$\therefore \left.\begin{array}{l}x=5,\text{ or }\frac{1}{2}\\y=2,\text{ or }\frac{1}{5}.\end{array}\right\}$$

Note.—Your writing is *very good*, but it would be improved if the looped letters were longer.

Geometry.

1. CONSTANT READER.—Prove that the sum of the squares described on any two right lines is equal to double the square on half the sum of the lines together with double the square on half their difference. (*Matriculation, June*, 1883.)



Let AB, BC be the two lines, and let BC be greater than AB.

Then the squares on AB, BC shall be double of the square on half AC, and double of the square on half (BC – AB).

Bisect AC in D.

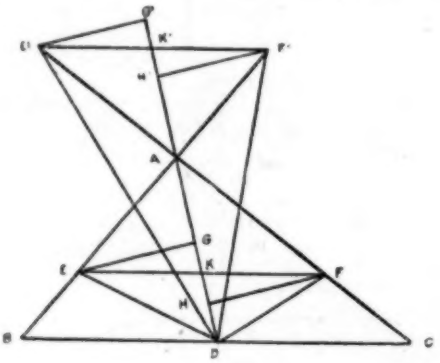
Proof.—Because the straight line AC is bisected in D, and divided in two unequal parts in B,

$\therefore AB^2+BC^2=2AD^2+2BD^2$; (II. 9.)

But AD = half AC
= half sum of AB and BC;
And BD = BC – DC
= BC – AD
= BC – (AB + BD)
= BC – AB – BD
2 BD = BC – AB.
$\therefore$ BD = half difference of BC and AB;

Wherefore squares on AB, BC = double the squares on half their sum and half their difference. Q. E. D.

2. P. T., Swansea.—The straight line drawn from the vertex of a triangle to the point of bisection of the base, bisects any line parallel to the base, and terminated by the sides, or the sides produced. And conversely any line so bisected is parallel to the base.



Let ABC be a triangle, and let AD be drawn bisecting the base BC.

Then AD or DA produced shall bisect any line parallel to the base BC, and terminated by the sides, AB, AC, or the sides produced.

Draw EF parallel to the base, and from E, F draw EG, FH perpendicular to AD. Let AD or DA produced intersect EF in K.

Join DE, DF.

Proof—$\triangle BDA = \triangle CDA$, (I. 38.)
$\triangle BDE = \triangle CDF$, ,,
$\therefore \triangle EDA = \triangle FDB$; (Ax. 3.)

Since these triangles have a common base, they must be of equal altitudes;

$\therefore FG = FH$;

In the triangles EGK, FHK,
$\angle EGK = \angle FHK$, (Ax. 11.)
$\angle EKG = \angle FKH$, (I. 15.)
and side EG = side FH,
$\therefore$ EK = side FK. (I. 26.)
Again, $\triangle CDE' = \triangle BDF'$, (I. 38.)
$\triangle CDA = \triangle BDA$, ,,
$\therefore \triangle ADE' = \triangle ADF'$; (Ax. 3.)
$\therefore$ Altitude E'G' = Altitude F'H';
Wherefore E'K' = F'K'. (I. 26.)

Therefore, AD bisects EF, and DA produced bisects E'F'.

Conversely.—In triangles EGK, FHK,
$\angle$s EGK, EKG = $\angle$s FHK, FKH,
and side EK = side FK, (Hyp.)
$\therefore$ side EG = side FH; (I. 26.)
Wherefore $\triangle EDA = \triangle FDA$;
and $\triangle BDA = \triangle CDA$, (I. 38.)
$\therefore \triangle BDE = \triangle CDF$; (Ax. 3.)

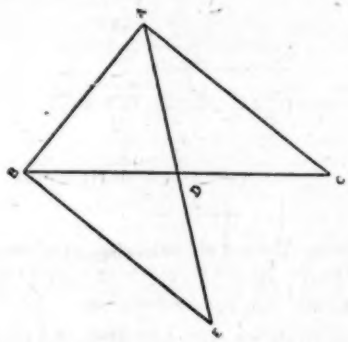
Wherefore EF is parallel to BC. (I. 40.)

Similarly it can be proved that E'F' is parallel to BC.

Therefore, if a straight line be bisected by AD, or DA produced, it is parallel to the base BC. Q. E. D.

Note.—Potts' 'Euclid,' 4s. 6d.

3. L. O. E., Shildon.—Show that the middle point of the hypotenuse of a right-angled triangle is equi-distant from the three angular points.



Let ABC be a right-angled triangle, having the angle at A a right angle, and let AD be drawn to the point of bisection of BC.

Then AD shall be equal to half BC.

Produce AD to E, making DE equal to AD (I. 3), and join BE.

Proof.—In the triangles ADC, BDE,
side AD = side ED, (Con.)
,, CD = ,, BD, (Hyp.)
and $\angle ADC = \angle EDB$, (I. 15.)
$\therefore$ base AC = base EB, (I. 4.)
and $\angle CAD = \angle BED$.

Because AE meets the two straight lines AC, BE, and makes the alternate angles CAE, AEB, equal to one another,

$\therefore$ AC is parallel to BE. (I. 27.)

Because AC is parallel to BE, and AB meets them, the two interior angles are together equal to two right angles; (I. 29.)
But $\angle CAB$ is a right angle, (Hyp.)
$\therefore$ $\angle ABE$ is a right angle.

Hence in the triangles BAC, ABE, the two sides BA, AC = the two sides AB, BE,
and $\angle BAC = \angle ABE$, (Ax. 11.)
$\therefore$ base BC = base AE; (I. 4.)
and AD is half of AE, (Con.)

Wherefore AD is equal to half BC, or the point D is equi-distant from the three angular points. Q. E. D.

Note.—Your solution is perfectly correct, and it is much simpler and neater to prove this deduction by making the angle BAD equal to the angle ABD; but we have proved it by joining the right angle with the middle point of the hypotenuse, according to your wish.

Publications Received.

Bell and Sons—

Code Standard English Grammar. Parts 1, 2. and 3. By G. P Mason, B.A.

Blackie and Son—

Domestic Economy. Parts II. and III.
Brave and True. By Gregson Gow.
Poor Tom Olliver. By Julia Goddard.
The Children and the Water-Lily. By Julia Goddard.
Johnnie Tupper's Temptation. By Gregson Gow.
Fritz's Experiment. By Letitia McClintock.
Climbing the Hill. By Annie S. Swan.
A Year at Coverley. By Annie S. Swan.
Lucy's Christmas Box: or How Georgie found his Cousin.
Cheep and Chatter: or Lessons from Field and Tree. By Alice Banks.
Shakspere's 'Henry VIII.' (Annotated).
Common Things—Elementary Science in Object Lessons. By J. Hassell.
Jack O'Lanthorn. By Henry Frith.
A Waif of the Sea. By Kate Wood.
The Golden Magnet. By G. Manville Fenn.
Dr. Jolliffe's Boys—A Tale of Weston School. By Lewis Hough.
The Wings of Courage. By Mrs. Corkran.
Hetty Gray: or Nobody's Bairn. By Rosa Mulholland.
The Patriot Martyr.
Picked up at Sea. By J. C. Hutcheson.
The Wigwam and the War-path. By Ascott R. Hope.
With Clive in India. By G. A. Henty.
By Sheer Pluck. By G. A. Henty.
Madge's Mistake. By A. E. Armstrong.
The Whitehall Test Cards. Standards III. to VII.
Principles of Agriculture. Stage II.
Botany. Parts I. and II.
Magnetism and Electricity. Part I.
'Poynter's South Kensington Drawing-Books.' Books I. to VI.

Chambers (W. and R.)—

Memoir of William and Robert Chambers. By W. Chambers, LL.D.
The Standard Algebra. Parts 1, 2, and 3.
Shakspere's 'As You Like It,' with Notes.
Chaucer: The Clerkes Tale, with Notes, etc.

Curwen (J. and Sons)—

Whittington and His Cat. By A. J. Foxwell and Josiah Booth. 'School Cantatas and Operettas.'

Fisher Unwin (T.)—

Leaders of Men. By H. A. Page.
Labour and Victory. By A. H. Japp, LL.D.
Master Missionaries. By A. H. Japp, LL.D.
Wise Words and Loving Deeds. By E. Conder Gray.
Footprints. By S. Tytler.

Griffith and Farran—

The March Hares and their Friends. (Illustrated.)

Heywood (John)—

The 'Try' Arithmetic. Parts V. and VI.
The 'Try' Arithmetical Test Cards. Standards I., II., III., IV., V., and VII.
The Teachers' Manual of Object Lessons. By A. Park, F.R.G.S., etc.
The Paragon Admission Register. No. 1. By R. Hyslop McCartney.
The Paragon Summary Registers. Nos. 2, 3, and 4. By R. Hyslop McCartney.
The 'Try' Arithmetical Test Cards. Standard VI.
Gardiner's Explanatory Geography. Part III. for Standard IV.

Isbister (Wm.), Limited—

Object Lessons and How to Give Them. By G. Ricks, B.Sc.

Jarrold and Sons.

The Teachers' Diary and Pocket Book for 1884.

Johnston, (A.)

Pictures for Schools:—
The Ash. The Pine or Fir. The Elm. The Oak. The Beech. The Mahogany.

Knight and Co.—

Report of the Committee of Council of Education (England and Wales), with Appendix, 1882-83.

Laurie (T.)—

Chemical Analysis. By A. H. Scott White.

Longmans and Co.—

Longman's Magazine, No. 12, October.
English Word Study—A Series of Exercises in English Etymology. By H. F. Campbell, M.A.
A Course of Simple Object Lessons for Infants. By W. Hewitt, B.Sc.
Workshop Appliances. By C. P. B. Shelley. Text-Books of Science.
Key to Jerram's Miscellaneous Sentences for Translation into French.
Longman's Magazine. No 13—November.
Longman's Geographical Reading Books. Introductory Book.

Marcus Ward and Co.—

Marcus Ward's Twopenny Atlas for Standard IV.
Marcus Ward's Threepenny Atlas for Standard V.
The Vicar of Wakefield. School Edition.

Nelson (T.) and Sons—

The Royal Map Books for Standards I., II., and IV.
The 'Prince' Readers for Boys. Standard I.
The 'Queen' Readers for Girls. Standard I.
The 'Royal Star' Readers for Mixed Schools. Standard I.
The 'Queen' Primer. Part I.
Self-Effort. By J. Johnson.
The Wars of the Cross.
Alda's Leap, and other Stories. By the Honourable Mrs. Greene.
The Babe i' the Mill.
Heroism in Humble Life. By the Rev. E. N. Hoare, M.A.
Eastern Manners and Customs. Nos. 44 and 45.
Plants of the Holy Land. Nos. 42 and 43.
} A Series of Picture Cards.

Relfe Bros.—

The Parts of Speech. By W. B. Irvine, F.E.I.S., F.R.G.S.

Smith, Elder and Co.—

The Cornhill Magazine, No. 4, October.
The First Book of Euclid Made Easy for Beginners. By W. Howard.
The Cornhill Magazine. No. 5. November.

Stanford, (E.)—

Geographical Reader. Book IV. By C. M. Mason.

Swan Sonnenschein and Co.—

Needlework for Ladies for Pleasure and Profit. By Dorinda.
The Elements of Plane Geometry. Part I.
An Illustrated Manual of Object Lessons.
The Reform of English Spelling. By James Coutts Crawford, F.G.S.

Thin (James)—

Handbook to Lectures on the Theory, Art, and History of Education. By S. S. Laurie, A.M., F.R.S.E.

Thomas (W.)—

The Landmark Memory Notes of English History.

Ward, Lock, and Co.—

The Universal Instructor. Parts 36 and 37.

Wesleyan Methodist Sunday School Union—

First Readings—Precept and Parable. No. 2.
Melissa's Victory. By Ashton Neill.

Publications Reviewed.

CHRISTMAS PRIZE BOOKS.

FIRST NOTICE.

Messrs. Blackie and Son's Publications.

WE have received from these well-known publishers a parcel of prettily bound and well-printed volumes, suitable for prizes to children of all ages. They are illustrated with a few full-page coloured prints, which, no doubt, will lend an additional attraction to the books as far as the young folks are concerned. Before speaking of them individually, we may say that they are all healthy in their tone, inculcating in different methods lessons of industry and goodness, which ought to act as coadjutors to the more formal moral lessons of the conscientious parent or teacher.

1. **The Wings of Courage and the Cloud Spinner.** Translated by Mrs. Corkram, from the French of George Sands.

Many of our great writers have devoted some of their time and talent to the preparation of works for children, and we doubt if at any time they were using their gifts more advantageously. Dickens, Thackeray, Miss Mulloch, all thought it no mean thing to write for children. The translator remarks in her well-written preface, that no one can write for children who does not love them. That George Sand did love children no one can doubt after reading these charming sketches, in which the supernatural is slightly blended with the every-day struggle for existence and advance in knowledge.

In the former of these two stories we find a little fellow hearing words of encouragement in the cry of a flock of birds, and in the latter we find a charming little girl learning, by the enforced sacrifice of a pretty cloud to be carded and spun into thread, that patience and industry can alone conquer difficulties, and that the very difficulties themselves may be spun into cords of usefulness and hope.

2. **Madge's Mistake.** By Annie E. Armstrong.

The mistake related here is a very common one made by the young, to wit, that an act of disobedience, if done for a kind reason, is almost justifiable. The story shows how much trouble may be entailed by such acts. There is also a lesson for fathers, that they cannot expect their children's confidence if they are severe and extreme to mark what is done amiss. The style of the composition is easy, and the individuals are fairly real personages and not impossible figures, a schoolboy of some fourteen years being the best-drawn character.

3. **Sheer Pluck.** By G. A. Henty.

This charming book begins with an account of a plucky boy who is at school by the seaside. The first fifty or sixty pages give us accounts of the ordinary hairbreadth escapes, brought about by the pluck of the hero. After this the story strikes out into fresher fields, and we find the hero alone, and afterwards almost penniless in London. A love of natural history, and an aptitude for reproducing living appearances with the skins of animals, enables the father of one of his schoolfellows to persuade a naturalist to take him with him to Africa, to assist him in collecting the different species to be found there. This naturally brings them into all sorts of adventures with the natives, until, after the death of the elder traveller, the hero gets mixed up with the Ashanti war, being practically a prisoner in the Ashanti camp. At the end of the book historical names appear, and the taking of Coomassie is graphically described. We heartily commend the book as worthy of a hearty welcome to all boys who would wish to be true English ads, and worthy of the epithet of 'plucky.'

4. **Hetty Gray.** By Rosa Mulholland.

This is a story which will interest girls far more than boys, there being only one in the book, and not a particularly attractive specimen. The little heroine, who is called on the title-page 'Nobody's Bairn,' is a pretty child who has been washed on shore from a wreck, and taken care of, first by a labourer's wife, then by a rich, silly lady, and lastly by a country gentleman, who is educating her for a governess, when her identity is discovered, and all ends happily.

5. **Picked up at Sea, and Other Stories.** By J. C. Hutcheson.

The lad whose story is told in the first of these stories loses his powers of speech and the use of his faculties by a blow inflicted before he is cast off from one ship, to be picked up by another, and is therefore, until recovered by another blow, little more than a faithful dog, always following the footsteps of a kind sailor who had sewn up his wound when brought on board.

Though all the stories are, more or less, about life at sea, and such as lads would enjoy, this story of 'Picked up at Sea,' chiefly describes the trials and difficulties connected with gold-mining in California, including a gallant defence of a small breastwork, thrown up at the mouth of the shaft, against hundreds of Indians. The 'Corsair of Chios,' the next longest story, is a thrilling tale of mutiny, piracy, and brigandage, but not so good as its successor, 'David and Jonathan.'

6. **The Patriot Martyr, and other Stories of Female Heroism in Peace and War.**

Boys and girls—aye, and men and women too—will never tire of reading the wonderful story of Joan of Arc, and though as a nation we are supposed to be very much ashamed of our action in her martyrdom, still it does not prevent our story-tellers, dramatists, and others from constantly recounting the exquisite tale from end to end.

The great maid's history, prettily told in the volume under consideration, is supplemented by other sketches of wonderful women. The Fisheries Exhibition, no doubt, will cause many to turn, on looking at the table of contents, to the few pages devoted to Grace Darling, in which the reader will find Wordsworth's stanzas on her heroism. The other women commemorated are the Countess of Nithsdale, Flora Macdonald, Deborah Sampson the Maid of Saragossa, Jeanie Deans, and Ida Lewis, the Lighthouse Keeper of Rhode Island.

7. **The Wigwam and the War Path.** By Ascott R. Hope.

This volume contains no less than seventeen sketches of Red Indian life. Whether the boys of the present day as greedily devour this sort of tale as they did some twenty or thirty years ago seems doubtful according to a return obtained the other day from some four thousand schools of all grades—from Harrow to Seven Dials. According to this return, Jules Verne is the king of writers for boys at the present time. And no doubt the amount of science which is taught in his books—although dressed up with the impossible, is very wonderful. Still, if boys like reading of anything so utterly impossible as a voyage to the moon, we doubt if the assurance of all these stories being true, if of less interest than the fictions of Fenimore Cooper, will recommend them to young readers. At the same time we heartily recommend them as well worth reading.

8. **With Clive in India.** By G. A. Henty.

The author having been so successful in other historical fictions, we are not astonished he has chosen so interesting a period as the early days of our rule in India to locate his characters. The book is of thrilling interest, and no lad can read it without impressing upon his mind the main facts of our occupancy of our Eastern Empire far better than he would in double the time spent over a school history.

SECOND NOTICE.

Messrs. T. Nelson and Sons' Publications.

THESE enterprising publishers have issued, as usual, some prettily bound volumes, which may well attract the attention of school managers at the present time.

1. **The Babe i' the Mill, and Zanina the Flower Girl of Florence.** By the Hon. Mrs. Greene.

The first of these stories is very sad and weird. A poor little child, having had her mind filled with ghost stories, is decoyed to her death. This circumstance is followed by events and scenes all more or less depending on this main fact. The finale is as happy, perhaps, as it could be, considering that the little heroine is really dead.

Zanina is a Florentine story, of a young girl who is drawn into a conspiracy, acting as a spy therein, but neither the structure nor the diction of this trifle calls for any notice.

2. **The Wars of the Cross.** By the Author of 'The Mediterranean, Illustrated,' etc.

This is not a story-book, but a somewhat long history, with far less flesh of anecdote than there might have been. No doubt, to get the history of three crusades into some 150 pages, so as to entice children to read it in their spare moments, is not an easy task; though liberally illustrated, the pictures are not very attractive. The book might make a fair text-book for a medium class in the higher-grade schools, and for such a purpose we shall hope to see it used, but if presented as a prize we fear it will fail in its object of disseminating knowledge under the guise of amusement.

3. **Heroism in Humble Life.** By Rev. E. N. Hoare, M.A.

This is a temperance tale, told without the exaggerations so commonly found in such stories. The author has evidently had some experience in reclaiming inebriates of humble life, and knows how to interest others in the same work. This book might be chosen better, perhaps, as a prize for the big night-school lad or young man than for the ordinary schoolboy. We like the book very much, on account of its sobriety of tone.

4. **Alda's Leap, and Other Stories.** By the Hon. Mrs. Greene.

This little volume contains no less than three distinct stories. Again Mrs. Greene indulges in the supernatural to a certain extent. The scene is laid in Piedmont, the time being that when a persecution of the Protestants took place there. The hero and heroine are of different religions, and on this fact a good deal of the story depends. 'Gabrielle of Zermatt' has an interesting climax, well told, and the third story is prettily related.

5. **Self-Effort.** By Joseph Johnson.

This is one of the best prize books which has come under our notice this season. It contains what practically are some twenty short, most readable, essays, on such subjects as 'Success in Persevering Industry,' 'Manners and Conduct,' 'Friends and Companions,' copiously illustrated by anecdotes of well-known successful men. We heartily commend it as an invaluable book, not only to lads beginning the world, but to others who would use their energies in doing good to the rising generation. The whole tone of the book is manly and thorough in the extreme. We cannot help quoting one passage as a fair specimen of the whole. It is taken from the chapter on 'Success in Self-Culture,' and is as follows:—'If all the youths employed in the weaving-sheds in Lancashire were to resolve to imitate and emulate Dr. Isaac Milner, because he was once a weaver, and that they, like him, would attain distinction as professors of mathematics, and occupy the position of deans in the cathedrals, they would fail. They would not fail however—not one of them would fail—if they resolved to attain to the possession of knowledge and intellectual development, and from the ranks there might then come, as in the past, some bright and beautiful spirit, blessed with a mental capacity capable of enriching and adorning the various fields of art, literature, or science.'

There were added to the parcel four packets of cards, containing five each, two of them illustrating in bright colours Eastern manners and Customs as described in 'The Land and the Book.' Texts of Scripture take up too much room in the pictures, being printed in ordinary type on a rectangular space. 'Flowers and Plants of the Holy Land' are the subjects of the other two packets, with the same fault, but otherwise very attractive and instructive for children.

The Works of Joseph Payne. Vol. I., Lectures on the Science and Art of Education. Edited by J. F. Payne, M.D., with Introduction by the Rev. R. H. Quick, M.A. Second Edition. London: Longmans, Green and Co.

Mr. Joseph Payne will be remembered by many teachers as the first Professor of the Science and Art of Education ever appointed by the College of Preceptors. He was himself a practical teacher, first as assistant in another person's establishment, and then as head of a large school of his own at Denmark Hill. While still a young man, Mr. Payne met with an account of the educational system of the French reformer, Jacotot, and from this he received an impression which remained throughout his after life. Jacotot's system was set forth by its author with all that love of paradox, and all that seeking for the startling in statement, which is at once the charm and the vice of much French literature. Jacotot declared that 'the pupil may be made to discover for himself everything requisite to be known,' so that 'a teacher can teach that which he does not know.' His method of teaching was, at first, pure memory task-work. He required his pupils, if they were French, to commit to memory the first six books of Fenelon's 'Telemachus'; or an equivalent portion of some classic in any tongue in which they were studying. For English pupils he suggested Johnson's 'Rasselas.' The scholar was required to learn so thoroughly as to be able to repeat by rote at any time the whole portion precedent to that which he was at the moment learning, and to answer any questions that might be put about it. To the objection that some children could not possibly learn to repeat a hundred pages of print right off, Jacotot calmly replied, 'All children have memory and an equal memory.' And what, our readers will ask, was said to be the use of this rote study of one author? The answer is supplied by Mr. Payne, as Jacotot's interpreter—'The pupils have learned to equal Fenelon in elegance and correctness of style—to approximate very nearly to Girard in detecting the difference of synonymous words—to criticise much better than Madame Dacier often did—to make general observations on literature not inferior to those of La Harpe—and, in short (for to mention all would, at this stage of development, provoke positive incredulity), to do more than was ever done by any child, except those who have been by common consent designated geniuses.'

The essay on Jacotot's method, from which we have quoted the above, was written by Mr. Payne at the early age of three-and-twenty. Of course, the cloudy nonsense of these ideas was quickly precipitated in the translator's mind by years and experience; but he brought away, nevertheless, from that study one great fundamental fact, for which he never ceased to thank the memory of Jacotot. This important truth was, that the teacher will do nothing for the child except in the precise measure in which he induces the mind of his pupil to act. The teacher is not a sort of great vessel of knowledge which is to pour its stock out into the small empty vessel afforded by the

pupil's ignorance. The learner can never passively receive instruction; he must actively exert his own faculties before he can learn. Therefore, 'the function of the teacher is that of an external moral force, always in operation to excite, maintain, and direct the mental action of the pupils—to encourage and sympathise with their efforts, but never to supersede them.'

This idea was so much the root of Professor Payne's teaching that we cannot more fairly indicate the character of his work, than by quoting the passages from the lecture on 'The Art of Education,' in which his views on this point are expressed:—'The essential part, the appropriation and assimilation of knowledge by the mind, can be performed by no one but the learner; for the teacher can no more think for his pupil than he can walk, sleep, or digest for him. It is, then, on the exercise of the pupil's own mind that his acquisition of knowledge entirely depends, and this subjective process, performed entirely by himself, constitutes the pupil's *art of learning*. . . . . It appears from what has been just said, that the only *indispensable* part of the process—the mental act by which knowledge is acquired—is the pupil's, not the teacher's; and, indeed, that the teacher cannot, if he would, perform it for the pupil. . . . . The indispensable part of the process cannot, it is true, be done without the mental exertion of the pupil, but it is equally true that it will not be done without the action and influence of the teacher. *The teacher's part, then, in the process of instruction, is that of a guide, director, or superintendent of the operations by which the pupil teaches himself.* . . . . . The teacher has recognised his true function as simply a director of the mental machinery which is, in fact, to do all the work itself; for it is not he, but his pupils, that have to learn, and to learn by the exercise of their own minds. He has constituted himself, therefore, as (if the expression may be pardoned) a sort of outside will and mind, to act on, and co-operate with the wills and minds of his pupils. He is the *primum mobile* which sets the machinery in motion, and maintains and regulates the motion; but the work that it does, the results that it gains, are not his work, nor his results, but the machinery's. In the case of the human machinery—the children's minds, which are not dead matter, but living organisms—he has had to supply motives to action, sympathy, and encouragement—to apply, indeed, all the resources of his science. But still he is simply the superintendent or director of the operations which constitute the learning or self-teaching of the pupils.'

We have quoted thus at length upon this one point, both because it was the central idea of Mr. Payne's views upon the science and art of education, and also because of the important practical conclusions for teachers which follow upon the recognition of the truth of these statements. If it be clearly seen that the teacher has simply to get the child to learn, it is clear that no style of teaching which leaves it to the child's option whether he will exercise his mind or not can be in accordance with right educational principles. Thus, teaching will necessarily be conducted, firstly, wherever possible, by calling upon the child's powers of *observation*, and requiring him to state what he sees, and, secondly, by asking him questions to compel him to use his own powers of *reflection*. Explanations, which the child may or may not attend to, as he chooses, are, according to Mr. Payne, sheer waste of the pupil's time.

This theory must by no means be confounded with a mere indolent letting a child alone with his book or his slate. On the contrary books would be very little used by the ideal teacher, not answering the fundamental requirement of compelling the child to really exercise the higher powers of his mind. Professor Payne describes a bad teacher as one who 'Coldly or sternly . . . . without any attempt to interest the child, without exhibiting affection or sympathy towards him, hastily gives him some technical directions, and sends him away to profit by them, as best he may—simply "orders him to learn," and leaves him to do so alone. . . . This transaction is inartistic, the element of humanity is altogether wanting in it. The great educator [Nature], in his teaching, presents a motive and an object for voluntary action; and therefore, excites attention by enlisting the feelings in the enquiry. The human educator, as an artist, is bound not only to excite an interest in the work, but to sympathise with the worker. This teacher (*i.e.*, the teacher who coldly 'orders the child to learn') does neither. His practice ought to exemplify the formula, *Ars=Natura+Homo*. He leaves out both *Natura* and *Homo*. His *Ars* therefore=0.'

Professor Payne maintained that the teacher should know human physiology, and hygiene, and logic, and moral philosophy. These form the foundation of the science of education, because they teach the nature and relationships of the faculties with which the teacher has to deal. If it be important that the secondary educator should be thus prepared for his work, it is yet more necessary that 'the earliest teacher should be an adept in the science and art of education. We should do as the Jesuits did in their famous schools, who, when they found a teacher showing real skill and knowledge in teaching the higher classes, *promoted* him to the charge of the lowest.'

We need not add to all the foregoing that we believe this to be a work of great importance, and that we strongly advise all teachers who can obtain the reading of it by no means to neglect it. We must, however, add, that the book would have been made far more generally accessible and useful had it been well edited. A collection of lectures given at different places, and to widely different audiences, but all on the same subject, naturally and necessarily contains a vast deal of repetition of ideas at least. In several instances, indeed, we find the very words repeated upon different pages, as for instance on pp. 119 and 133, or 61 and 144. Now a portly tome of nearly four hundred closely-printed pages is necessarily so expensive as to be a sealed book to a great many of those whom this volume would most interest and serve. Dr. Payne would do good service to the cause to which his father's life was devoted if he would produce, at a moderate price, the comparatively small volume which would contain all the important thoughts and illustrations that the valuable book before us affords, but would omit the useless repetition of the same facts and ideas which are here to be found.

Memoir of William and Robert Chambers. By William Chambers, LL.D. Twelfth Edition. London and Edinburgh: W. and R. Chambers. 1883.

It would be difficult to imagine a book more suitable for a prize or Christmas gift for any lad, but more especially for one who will have to make his own way in the world, than the volume before us. It consists, practically, of two autobiographical sketches, for Dr. Robert Chambers left behind him a number of memoranda, which his brother has incorporated with recollections of his own into this life of them both. Readers who saw the first edition of this book must not think that it is now precisely the same volume. We remember reading, some years ago, with the greatest interest, one of the earlier editions, which was only a small volume of some 200 pages or less. The present edition is enlarged to 400 pages, handsomely bound and embellished with portraits of the brothers.

No more instructive story was ever perused than this one, of how two lads began, at the very bottom of the ladder, and, by the most honourable means, worked their way, step by step, very far up its difficult course. Every part of the volume is fraught not only with the keenest interest,—an interest which arises not less from the cultivated literary style and the keen sense of humour of William Chambers, than from the nature of the story,—but also with valuable moral lessons, which are all the more effective and useful from the fact that the book is not designedly a sermon upon these points. The account of the father, who was 'nobody's enemy but his own,' in common parlance, but who, nevertheless, inflicted upon his 'delicate and ladylike wife, whom circumstances made a heroine,' and on his children, all the hardships of the deepest

poverty, is itself a warning example to the class of minds which may require the stern lesson that a genial disposition has its own special temptations, and that generosity without judgment is as mischievous in its results as even cold-hearted selfishness. As a direct consequence of this father's kindly weakness, the two boys were turned upon their own resources before they had attained the age of fifteen. William, apprenticed to a bookseller, and living upon one-and-ninepence per week for food, walking miles daily with his employer's circulars about state lotteries, and rejoicing beyond measure when a generous winner in the lottery presented him with a guinea, at the very moment that his father lay broken down and helpless, so that he had the rare delight of putting the bit of gold into his mother's hand at the moment when she needed it most; or getting up at five o'clock in the morning to go to read for two hours and a half to a baker while he kneaded his bread, and taking a hot roll as payment for this work; then starting in business for himself, aided by a trusting bookseller's traveller, binding old books with his own hands, and presently purchasing a jingling, worn-out printing press, and printing for himself his first publishing undertaking,—here already is a story more interesting and more full of real heroism than is to be found in a dozen fictions. Then Robert the scholar, half lame and loving books, obliged by want of means to turn back in his course as a divinity student, and to see other lads, who did not care for their advantages, going on with their studies; at the age of sixteen starting as a secondhand bookseller with all the old books of the family gathered upon a stall outside a shop, rented at £6 a year; and presently becoming the writer of a tiny periodical, printed and published by William; disappointed again and again in his literary undertakings, but finally reaching his first success; here, again, is a tale full of interest. The lessons in thrift, perseverance under difficulties, hopefulness, industry, inventiveness, and honesty, lie upon the surface. The real charm of the book, however, can only be appreciated by those who read it.

Bright and lively in its style and full of illustrations of a by-gone state of society, it is one of those books which almost any boy will read with as much pleasure as he will inevitably carry away from its pages lessons that may turn to his lasting profit.

Melissa's Victory. By Ashton Neill. London: Wesleyan Methodist Sunday School Union.

This story is suitable for a gift-book for the elder girls in Wesleyan schools. It is so distinctly (though quite inoffensively) sectarian in tone that it would not be more generally applicable for prizes. It is not, either, a story for children. Melissa is converted by attendance at a Wesleyan Chapel, and is driven by her parents' stern anger at her secession from Church to leave home for a housekeeper's situation in a Methodist family. Her steadfastness in the faith is contrasted with her yielding obedience, when her relatives request her to give up an objectionable lover; and, in fact, in the last chapter we see Melissa as a happy old maid at a prayer-meeting. A gipsy girl with mysterious memories, and a foundling young man, excite the reader's interest; but their origin is never cleared up. They are drowned together, while the young man is running away from his duties, having failed in the performance of them because lacking religion; and the distinctly Methodist tone of the book may be judged from the fact that both these young people are 'saved' by the intervention of the Holy Spirit, in the midst of the storm in which they die. The circulation of the book is clearly limited by its religious doctrines; within the large and important body whose views it meets it will doubtless obtain a good deal of popularity.

Footprints. Nature seen on its Human Side. By Sarah Tytler. London: T. Fisher Unwin.

We very much doubt, if the authoress had not been as successful as she deservedly has with other publications, that this volume would ever have seen the light; at the same time, we are bound to acknowledge that this is a second edition; we may therefore argue that a considerable number have sold.

Few authors whose very names will sell any publication, however light, can resist the temptation to write to order, when it means money, and small blame to them.

This volume consists of eleven chapters, of which the first is entitled 'In the sky; on the clouds; among the sun, moon, and stars.' The authoress wishes to show how even man's ideas and fancies have impressed themselves even there, telling us of much folk-lore and many superstitions, or perhaps rather we ought to say, the observations of successive generations, by which the shepherd or others may prognosticate the weather.

The fourth chapter, called 'Along the rivers and lochs, and by the brooks,' gives amongst other things a pretty description of the Thames from its source to its mouth, touching lightly on the different points of interest, referring to a hero here or a martyr there.

Other chapters tell us of the footprints of man among birds, domestic animals, and, lastly, among a few of the wild beasts and living creatures, great and small, of the British Islands.

The book is copiously illustrated with not very first-rate woodcuts, otherwise the appearance is most attractive and prize-looking.

The First Book of Euclid, made easy for Beginners. By William Howard. London: Smith, Elder and Co.

This little book certainly stands alone amongst the many publications which have been devised from time to time to assist youthful students in geometry. We have seen treatises on the subject in which a difference in the mode of drawing the lines in the figures was utilised to distinguish the facts given and the facts to be proved—lines which were simply subsidiary to the main aim of the proposition being represented by dots, and the others being continuous. But this little work is the first, as far as we know, in which the aid of colour has been invoked. We are sorry we cannot say we are exactly pleased with the way in which it has been introduced, for we fancy it might have been much more effectively employed. Mr. Howard's only aim in employing colour has been to avoid the use of letters, his idea being, to quote from the preface, that the use of letters is a difficulty to many youthful minds, and that the use of colour will not only avoid this difficulty but also remove the temptation to endeavour to repeat the problem by rote. For our own part we think that a boy who cannot understand how to name a line AB or an angle ABC by the usual plans adopted in the school books on geometry has not intelligence enough to render the study of geometry profitable to him, and would probably do better in following some pursuit which required less strain on his reasoning powers. Mr. Howard's method, though ingenious, is very cumbersome, and most people will, we think, agree with us that the angle ABC is far simpler and fully as easy to understand as 'the angle formed by the dotted blue side (of the triangle) and the dotted red side.' And surely every boy would find it easier to follow the simple injunction 'join BC' than to comprehend the highly roundabout verbose rendering—'join the end of the part cut off with the point where the blue line meets the black line.' And as for 'the temptation to endeavour to repeat the problems by rote,' that difficulty can be effectually removed, as our own experience can testify, by the constant use of the blackboard, the utilisation of different letters to those employed in the text-book, and by taking care that the boys know the meaning of the terms they use.

We are convinced that if the author had been contented with utilising colour to distinguish the 'things given' from those 'to be proved' and from those subsidiary to the proposition, the result would have been a more effective school work. We have not to complain of the manner in which the book has been brought out. The printing and paper are both excellent, and the register of the coloured figures simply perfect, every line being as truly placed as if drawn by hand.

The Paragon Registers. By R. Hyslop McCartney. London and Manchester: John Heywood.

Under the above title Mr. John Heywood has published a new series of registers for use in public elementary schools, consisting of Admission Register, Class Register, Half-time Register, and Summary. The Admission Register for 1,500 names is well bound, ruled, and printed. The Class Register is for fifty names, the names to be written half-yearly. This plan gives three fly-leaves in each principal opening, a feature which may very easily lead to mistakes in the hands of young teachers. One of the fly-leaves is without the usual numbers, and in the specimen given of the method of filling the register we notice that the names are not arranged alphabetically, nor are the surnames written first both obvious advantages, which we should have expected to see employed in registers called 'Paragon.' The ruling for fifty-four weeks will be of service when the school year happens to begin and end in the middle of a week. Neither the ruling nor the printing of this register is so good as that of the Admission Register; in several places the dividing line between morning and afternoon attendance in the copy before us being entirely wanting.

The Half-Time Register is very complete, and will serve equally for large or small schools where such a register is necessary to be kept.

The Summary is also very compact, but we think the two pages containing the weekly totals might with great propriety have occupied four, the ruling being very close, the classes too few, and the provision for dates being entirely omitted.

All the registers have stiff covers and are provided with the latest instructions as to registration, and with special directions where needed.

The Golden Magnet: A Tale of the Land of the Incas. By G. Manville Fenn. London: Blackie and Son.

This is a thrilling tale of adventure, which boys will read with rapt interest. A brief prologue tells that when the Spaniards invaded Peru, three hundred and fifty years ago, the priests of the sun guarded the rich golden treasures of their temples from falling into the clutches of the conquerors, by depositing the precious things in secret hiding-places. The hero of this story goes to seek his fortune in South America, and, possessed by the legendary tales of hidden gold, penetrates in search of it into an awful cavern. Here he plunges into mystery and danger of the most exciting kind. A secret lake, hidden in black darkness, an abyss dipping deeper into the earth than ear or eye can follow, and an interior chamber, the home of sea-fowl and a store-house of tons of guano, are all amongst the secrets of this wondrous cave. After a hundred hairbreadth escapes, the hero and his faithful henchman find the treasure. But still their adventures are not ended, for they have got many chapters of romantic exciting interest to go through before they bear the treasure off from the watchful care of the natives, and the jealous anger of a Spaniard, who figures in the story. There is a touch of sentimental interest, without any love nonsense, in the book.

Mr. Manville Fenn has supplied a tale which meets that desire for the sensational and adventurous which is inherent in boys of spirit, without any of the drawbacks that are often to be found in similar works. Tone and style are alike good, and the book can be thoroughly recommended to all in search of works of this character.

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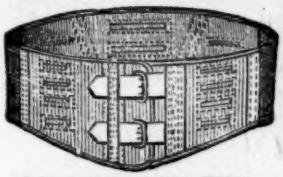

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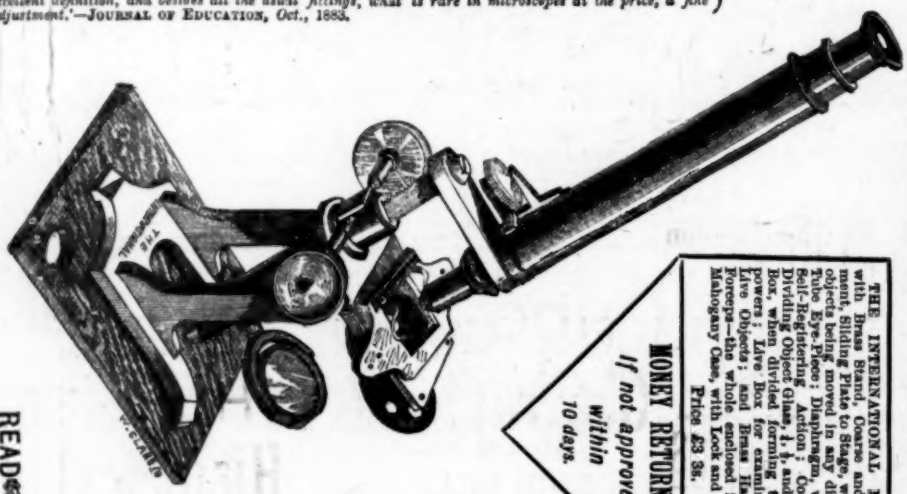

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